FORESTRY ABSTRACTS

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A SUMMARY OF INFORMATION ON *PTEROCARPUS ANGOLENSIS*

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1. INTRODUCTION

Although *Pterocarpus angolensis*, for which the British Standards Institution has registered the name Muninga, is one of the more valuable timbers of the African continent, surprisingly little information has been published about it. One reason may be its sparse scatter over vast tracts (probably a million square miles), giving a very small yield per unit area and rendering intensive management difficult and unattractive. The concentrated planting of fast-growing softwoods will continue to offer a more attractive investment unless and until more intensive management of the stands in which Muninga occurs, e.g. through a strong demand for mining timber, justifies the application of silvicultural measures that include in their aims accelerated growth and more concentrated production of this species. Elsewhere, production might be fostered by co-operation with African farmers, and in tsetse-fly areas through making 'discriminatory clearing' serve as heavy improvement fellings. If value increment is considered the tree must stand very high among African species. In Tanganyika it can be cut more than 100 miles from the railway, railed halfway across the territory, shipped to the Union of South Africa, railed again to Johannesburg, and still be sold at a profit.

2. TAXONOMY, TRADE AND NATIVE NAMES

Pterocarpus angolensis was first described by De Candolle [Prod. 2: 419]. *P. angolensis* and *P. erinaceus* are readily distinguished from other African species by the long slender bristles on the centre part of the pod. The latter, which is confined to the savanna woodlands of West Africa, can be distinguished from *P. angolensis* by its more symmetrical pods, with the style remaining near the apex.

The chief trade names of *P. angolensis* are Muninga (B.S.I.), Mukwa, Mulombwa and Kiaat. Innumerable native names exist, of which the following are a selection: *Angola:* Girasonde, Mirahonde, Murilahonde, Mutete. *Bechuanaland:* Mokwa, Molombe, Moowa. *Belgian Congo:* Mutondo, Mutondo-mashi, Mulombwa, Mlinga, Mubalakula. *Mozambique:* Mbila, Mecurambira, Gulombira. *Northern Rhodesia:* Mukwa, Mulombwa, Mulombe, Ndombe, Mukulu. *Nyasaland:* Mulombwa (general), Mtubati, Mbila. *Southern Rhodesia:* Mukwa, Mvagazi, Mukwamaropa, Mukurambira, Bloodwood. *Tanganyika:* Muninga, Mtumbati, Muhagata. *Union of South Africa:* Munaabenaabe, Mokoto, Ngillasondo, Kiaat, Transvaal Teak, Sealing-wax tree.

3. DESCRIPTION OF THE TREE; DIMENSIONS

Muninga is a small to medium-sized deciduous tree with a cylindrical bole and a thin-foliaged spreading crown. Mean bole heights (lengths) from sample-plot data in Mozambique [2] are 57% of total height, a figure of 50% being suggested for Tanganyika. The angle and curve of the branching in

young and immature trees resemble the ribs of fan vaulting, where they spring from the pillar [fig. in 8]. In saplings and poles this graceful branching is often preponderatingly to one side; in older trees the crown forms a flattened hemisphere. There is little or no published information on the root system. The seedling soon produces a thick taproot up to 2·5 feet long and laterals that spread during establishment to 24 feet [fig. in 62]. In the groundnut-scheme clearings of Southern Tanganyika, it was noted as typical that a tree of 36 in. g.b.h. had 8 lateral roots up to 8 in. in diameter, and one of 48 in. girth had 15 laterals up to 6 in. diam., the thick portion of the taproot being 2 feet long. The bark, at first smooth in young stems, becomes chapped with longitudinal fissures, recalling that of *Salix alba* [10]. On older stems it is grey-black or reddish with a crocodile-skin pattern, consisting mainly of oblong shelly scales with cork below. The lower 8 feet of the bole is often blackened by fire and discoloured from termite earth tunnels. The general appearance and colour is often reminiscent of Scots Pine. The bark thickness varies from 0·1 in. in a stem of 0·5 in. diameter to 2 in. in one over 12 in. diameter [23]. The blaze is grey-black towards the outside, then red-brown, grading through a creamy brown to yellow-white, with concentric rings of black-crimson flecks where the golden-yellow kino exudate has congealed. If the bark is hacked or the bole cross-cut, a profuse exudation of this resinous kino occurs and assumes, as it dries, a dark red colour, giving rise to the name 'Bloodwood'. The leaves are imparipinnate with 4–8 pairs of sub-opposite leaflets, ovate to ovate-oblong, 3–8·5 × 1·8–5 cm., usually more or less acuminate. They are densely pubescent when unfolding. The upper surface of mature leaves is generally glabrous and dark green; the under-surface retains some pubescence mostly at the nerves and is duller and paler in colour. The yellow papilionaceous flowers are produced in several- or many-flowered racemes, mostly on the previous season's shoot, before or at the same time as the leaf buds burst. They are sweet-scented and are visited by honey bees. From 1 to 6 pods are produced from a raceme [23]. The pods are 5–15 cm. in diameter, orbicular, with a broad membranous wing and a densely-bristled thickened centre, in which lie 1–2 seeds.

As regards dimensions, in Angola the tree is stated to be a component of the shrub stratum (2–8 m.) of vast *Brachystegia* forests [21]. In the Belgian Congo, Delevoy [10] gives the range as 8–10 m. high, 0·30–0·40 m. d.b.h., with some examples going to 20 m. and 0·60 m. diam. The Congo flora [24] states that it is a tree of 12 m. height and 30 cm. diam. with a 3-m. bole. In Mozambique the dimensions are 17–22 m. high, 0·3–0·7 m. diam., with 5–18 m. of bole [42]. In S. Rhodesia and Nyasaland [8] the tree is described as 40–60 feet high with a clean bole of 25 feet and b.h. diameters of 12–16 in. In Western Tanganyika the tree is rarely more than 50 feet high and the bole rarely more than 25 feet long or 30 in. d.b.h. [23]. In Eastern Tanganyika diameters up to 46 in. have been recorded, and the largest tree measured in the groundnut enumerations in the south-east was 43 in. diam. In Northern Rhodesia a tree of 90 feet total height has been recorded from the Copper Belt, and the best straight log (from the same area) was 30 feet long by 10 feet in girth (38 in. diam.). In this territory it is reported that extensive areas on the western side carry Muninga but that it never makes a reasonably sized tree. These areas may contain an ecotype or genotype related to that of the Angola forest which is composed of dominants similar to those of the 'mixed Mutondo' forest of N. Rhodesia. In South Africa, Scott has reported diameters to 24 in., the logs being 12–15 feet long, but in recent years the averages have been 7–8 feet by 14 in. diam. There is a distinct suggestion in the published and unpublished material on the Belgian Congo, Mozambique, Nyasaland, Tanganyika and South Africa, that large timber is found on special sites where the species is often gregarious. The whole question is complicated by the unknown extent of its past exploitation by man, destruction for agriculture, and damage by game, particularly elephant.

Tables have been published for crown and breast-height diameters in Tanganyika [23] and in Mozambique [42]. The data appear to reflect differences in stocking and site:

D.b.h. (in.), Tanganyika ..	1·59	3·57	5·79	7·99	10·54	12·97	15·23	17·90	21·03	
Crown Diam. (feet)	5	10	15	20	25	30	35	40	45	50
D.b.h. (in.), Mozambique ..	—	—	—	—	14·27	17·72	20·67	23·62	27·16	29·92

More than one writer has commented that a more exact knowledge of these ratios might be useful in aerial survey.

4. Distribution and Habitat

The species occurs in Angola, Bechuanaland, the Belgian Congo, Mozambique, Northern and Southern Rhodesia, Nyasaland, Tanganyika and the Union of South Africa, in various types of vegetation and climate and on a wide range of soils [3]. The main distribution coincides with the broad belt of *Brachystegia/Julbernardia* woodlands which lies in a concentric arc, east and south of the central African rain-forest block, from Lake Victoria to Angola, but extends into the intervening wetter ecotone belt of high-grass/short-tree savannas, recognized in Nigeria as the Southern Guinea

Savanna. In the west, however, its place is taken by the vicarious species *P. erinaceus*, a 40–50 feet tree, formerly exported as Rosewood. In Angola [21] Muninga forms part of the shrub substratum (2–8 m.) of the *Brachystegia/Julbernardia* woodland, occupying on the plateau (800–2000 m.) about 40% of the territory, with a southern limit in the latitude of the Victoria Falls. The annual rainfall is 1300 mm. The soils are generally clayey, sometimes sandy, but fertile. It is also found in a high-grass/short-tree savanna and in *Oxystigma* gallery forest, where its young growth is stated to be scarce. In Bechuanaland it is found in the north-east corner (Chobi District) in *Baikiaea* forest similar to that across the Rhodesian boundary. Trees of good form occur at its southern limit, the Upper Tati District [36]. In the Belgian Congo [10, 24] Muninga occurs in the Kwilu-Kasai drainages of the southern slopes of the Congo basin in continuations and outliers of the Angola forest. In the Katanga Province, 50% of which is covered with *Brachystegia* forest, it was noted that the numbers of inventories containing this species fell away from 75 to 0% as site quality declined from 1 to 5, indicating its need for good soil conditions. It is occasionally the dominant species on good soils near Lake Tanganyika, along the western coasts of which it probably occurs, and the most northern locality reported is at Lake Edward [24]. For a distribution of the vegetation concerned, see Duvigneaud's map [13]. In Mozambique, some two-thirds of which are covered with *Brachystegia/Julbernardia* forest, Muninga occurs in almost every province [42]. It is abundant in Manica and Sofala especially in the Beira district, while almost pure stands of good current growth are found in Inhaminga and Buzi. Pedro states that the finest specimens occur in mixed stands and lists 27 of its chief associates. These include the typical trees of the high-grass/low-tree savanna of Tanganyika and those peculiar to its south-eastern type near the Mozambique border. The species of the *Brachystegia/Julbernardia globiflora* forest are also included. Andrada [2] gives detailed lists and measurements from 14 plots in the Derre District in this type of forest. *Julbernardia* (*Isoberlinia*) *globiflora* was the chief associate and either *Brachystegia spiciformis* or *B. boehmii* supplied the other most frequent species of the canopy. These communities are paralleled in most of the Eastern African territories. Andrada states that Muninga is the premier component of the Mozambique forests. It is found on the best sites in the Derre district to average 27 trees/ha. (10·9/acre) composing 7·8% of the stem number and having a mean diameter of 36 cm. (14·2 in.) and a basal area of 2·7518 sq. m./ha. (12 sq. ft./acre), a figure unequalled by any other species. For Nyasaland, Willan [63] has presented a vegetation map showing a narrow band of *Pterocarpus/Bauhinia* forest following the foothills of the escarpments, the whole western length of the Nyasa trough and both sides of the Shire valley to the south. In its best development in this zone, Muninga has an understorey of *Oxytenanthera abyssinica* (cf. Troup [55] for a similar association in Burma of *Pterocarpus* with a congener of this Bamboo). Some of the Muninga here occurs almost gregariously, individual stems being practically straight and attaining heights of over 60 feet with b.h. girths of 6–9 feet. The tree also occurs very sparsely in *Brachystegia* associations, the most extensive type of vegetation in the country. In the Lilongwe district (3000–4000 feet) it is common, usually as a crooked tree, 30–40 feet high on rocky slopes.

In N. Rhodesia the tree is found between 2000 feet with a 26-in. rainfall and 4000 feet with rainfalls up to 55 in. Temperatures range from a slight morning frost in the middle of the 6½-month dry season to over 90° F. in the one wet season. Trapnell's studies of vegetation and soils [54, 64] throw considerable light on the requirements of the species. It grows well on Kalahari sands and their contact soils, deep dry fine-grained sands with the water-table over 100 feet down. Most well drained and newly formed soils, if sandy or porous, will suit it, whether derived from acid or alkaline rocks, so that it is often found on slopes of hills and rocky outcrops. Soils derived from disintegrating laterite also often carry it. Its best development is seen on colluvial, freely drained red-brown loams.

Muninga is sparsely scattered throughout the *Brachystegia/Julbernardia* woodlands. These occupy about 45% of the total area (290,320 sq. miles), but Muninga is said rarely to attain large sizes on the plateau soils [64] which are widely occupied by these woodlands. In Barotseland it is found on most Kalahari sand types except the *Cryptosepalum* woodlands and dense *Baikiaea* forests, and attains its best development in open woodlands with *Guibourtia*, *Baikiaea* and *Ricinodendron*. It occurs also in Trapnell's other deciduous woodlands except the Mopane type, but is generally of poorer growth. In his high-grass woodland or 'chipya' types it is a dominant in one, with *Erythrophleum africanum*, and in another with *Combretum* spp. In one of these types, where the soil is colluvial transitional and the rainfall less than 40 in., 77 stems per acre have been recorded. It is also to be found in wetter types (above 40 in.) where tree and shrub species suggest a seral stage to dense forest. In the north Kalaba district in *Burkea africana* woodlands, 30 stems per acre occur but the growth is poor. Two stems per acre in the *Brachystegia* types is quoted as exceptionally high.

In S. Rhodesia, between altitudes of 3000 and 5300 feet, Muninga is most commonly found, scattered or gregarious, on the Kalahari sands of N.W. Matabeleland, with rainfalls down to 22 in. (Gwaai).

It occurs scattered also in the *Brachystegia/Julbernardia* woodlands. In the humid lowlands of the south-east near the Transvaal border, it is found as a co-dominant with *Parinari mobola*. It is most important in the *Baikiaea* forests on the Kalahari sands, where three subtypes are differentiated, the first two already indicated in the paragraphs on N. Rhodesia. The first sub-type, which constitutes the main source of exploitable logs, contains *Baikiaea/Guibourtia/Erythrophleum/Ricinodendron*. In the second, Muninga is a co-dominant with *Burkea* in depressions and seepage zones. Here 50 and more trees per acre occur, but girths rarely exceed 3¼ feet and there is periodic frost damage. The third type has an almost pure overstorey of Muninga with a dense, 5-foot-high underwood of *Baikiaea*.

In Tanganyika the tree is found throughout the *Brachystegia/Julbernardia* woodlands, which cover 119,000 sq. miles or about one-third of the whole territory, and in the high-grass/short-tree savannas that enjoy a higher rainfall or fresher soils. The climate, which may be taken as representative of the more northerly range of the woodland type, shows mean temperatures of the coldest and hottest month as 62–70° and 70–77° F. respectively, with all monthly means above 48°. There are 6–7 months with less than 1·5 in. of rain. The season of drought is winter and the mean annual rainfall is 30–45 in. [62]. In the high-grass/short-tree savannas, hotter summers and winters, shorter dry seasons and more rain are general. The tree is found from near sea level to at least 5300 feet. Over a vast area, it occurs on plateau soils as in N. Rhodesia, but is apparently of superior growth. At escarpment bases, as in Nyasaland, e.g. the Mwera Plateau, Southern Province, girths up to 13 feet have been measured in gregarious stands. Groome [23] has published a very detailed account of Muninga in the Western Province. His extensive enumerations of the canopy trees show that in general *Julbernardia* spp. (*J. globiflora* and *J. paniculata*) may form up to 70% of the stock and *Brachystegia* spp. (*B. spiciformis*, *B. boehmii* etc.) up to 50, with Muninga usually the commonest other component, composing sometimes as much as 25% of the stems but averaging over large areas rarely more than 10%. Other valuable associates are listed. Extending northwest of Mpanda is a dense Bamboo (*Oxytenanthera*) thicket type in which Muninga and three others are the only common trees (cf. Nyasaland). Though this *Brachystegia/Julbernardia* woodland (already referred to for the other East African territories), is important in the Southern Province, the enumeration of the groundnut-clearing areas there revealed other types, some of which resemble the high-grass/short-tree savannas of Mozambique. An open *Oxytenanthera* type occurs there also and the presence of *Ricinodendron* recalls the Rhodesian Zambezi communities. For further details of the soils and vegetation concerned see Milne [37] and Gillman [18].

In the Union of South Africa the species occurs in the Transvaal, Swaziland and Northern Zululand, but most commonly on the lower foothills of the Drakensberg Mountains, where rainfall averages 30–40 inches. It is also found higher up in the foothills, to 4000 ft., and down into low veld at 2000 ft. with a rainfall of 15–20 inches. It is found on soils of granitic or doleritic origin which preponderate in the favourable climatic zones, and to a lesser extent also on sands and sandy loams of sedimentary origin, usually in association with *Sclerocarya caffra*, as well as with other, predominantly leguminous, bush-veld trees. It never occurs in high forest and tends to be gregarious. Acocks [1] names it as a typical tree of the Lowveld Sour Bushveld, which appears to be a high-grass/short-tree savanna seral to tropical forest, and Pole Evans [43] notes *Parinari mobola* and *Diospyros mespiliformis* as conspicuous associates.

5. Leaf-flush, Flowering, Fruiting and Leaf-fall

Systematic phenological records are available only for S. Rhodesia [64], where observations over a 10-year period at Gwaai showed flushing to occur 4 times in September, 5 in October and once in November, and leaf-fall once in February, 5 times in March, 3 in April and once in June, figures indicating a 20- to 28-week growing season (mean 22·5). The wettest and the driest years of the decade each had the longest growing season (28 weeks). In N. Rhodesia the sum of observations gives from mid-September to mid-October for leaf-flush, i.e. towards the end of the dry season after the first few showers of the rainy season have fallen. This flush coincides with or follows soon after the appearance of the flowers. In Tanganyika, herbarium specimens collected in different years from widely separated localities indicate mid-October as the usual time for flowering, while casual observation suggests that the growing season is longer than at Gwaai, with leaf-fall about the end of May, the Muninga along with *Sterculia quinqueloba* and a *Lannea* being the first trees to lose their leaves in the Tabora area. In N. Rhodesia leaf-fall has been recorded in April, May, June and early July, which may also indicate a longer growing season than at Gwaai. The early leaf-fall and the conspicuous fruiting on the leafless tree make for easy visual recognition of this species from the air at 1000 feet at that time. In N. Rhodesia the fruits have changed from green to a golden brown by January; later they turn greyish brown. They are dry by April and begin to fall in June and July, finishing usually

by October though some may persist into the next year. This statement probably represents the general case, the fruits remaining green longer in the more protracted rains of the north.

6. Fruit and Seed

Though the fruits are conspicuous on Muninga, the actual number of branch terminals is not great in this light-canopied species, suggesting that in smaller trees it might be possible to photograph and count the majority of the fruits [fig. in 8]. The tree is stated to produce a reasonable quantity of seed each year, with exceptionally heavy crops in some years. In N. Rhodesia, the years 1939, 1948, 1949 and 1952 were such years, while 1937 was a poor one.

Dispersal is by wind, which rolls the fruits and occasionally lifts them in 'dust devils'. They have been noted 2 miles into a grassland depression.

An examination of over 1000 fruits collected in June near Tabora [64], both from the tree and from the ground (with wings in various stages of decomposition), showed that apparently good seeds per 100 fruits numbered 90·9 for the former against 36·6 for the latter. Fruits should be collected from the tree or freshly fallen with undecomposed wings. Apparently good seed (free from mould and insects, with fresh colour and well filled) from this collection was separated for colour, then cut and examined for quality, giving the following (in %): Pink-brown (haricot-coloured)—good 32, rotten 1; red mahogany—good 31, discoloured cotyledons 19, rotten 3; black mahogany—probably good 8, discoloured cotyledons 5, rotten 1. The best seed, it was concluded, should be pink-brown with well filled testa, free from mould and insects, the cotyledons cutting crisply and showing a cream colour with greenish margins. Darker-coloured seed should not be rejected on colour alone. The seed is a clog-shaped bean, coloured as above. A long hilum runs along the upper edge. The funicle scar at the toe lies over the plumule, which has round it the two round-tipped cotyledons, lobed on one side at their bases. Dimensions of the seed are stated [64] as 9–11 × 5–9 × 2–3 mm., and the dry ripe fruits weigh 10 lb. per 1000. About 6·5% of these carry 2 seeds and 5·7% have 2 good seeds. An extraction test gave 69 oz. of good seed from 128 lb. of dry fruits, i.e. about 0·54 oz. of good seed per 1 lb. of fruit; part of the seed was lost by damage. There are about 2000 seeds to the pound and, allowing for loss by damage in extraction, about 67 seeds per pound of fruits (70 is a figure for N. Rhodesia).

The central part of the fruit is the pod proper, which has, by faster growth on one side, brought the style round towards the fruit stalk. On the outside of this flat spiral growth is the broad wing. The pod itself has a very tough-fibred wall, and to free the seed it is necessary to cut one edge and open it out, a very tedious hand operation taking, for the 128 lb. mentioned above, some 58 man-hours per pound of good seed. No machine has yet been devised for this simple operation.

7. Germination and Longevity of Seed

Germination is epigeal. The following, described from an examination of 50 germinating seeds from pods anchored flat on the bed in a N. Rhodesian nursery, is probably the normal method in nature [64]. In every case the radicle emerges first from beneath the underside of the wing, from a point on the pod directly opposite the stalk [cf. 55]. After the radicle is firmly set in the soil, the cotyledons are withdrawn from the pod by the arching of the hypocotyl, this action tearing out an exit through the wing adjacent to the pod. Sometimes the radicle or even the cotyledons are trapped within the pod, when laterals or shoot may penetrate the walls to continue growth. Where, however, edge-cut pods or extracted seeds are sown, germination is simpler, the radicle growing out and down, and the hypocotyl arching and pulling out the cotyledons.

About 6½ pounds of seed kept in paper bags in a dry store for 5 years at Morogoro, Tanganyika, was reduced by the removal of floaters and insect-attacked seed to 5 pounds. One thousand seeds of this resulted in 106 seventeen-month field plants, a proportion that could probably have been improved by better nursery treatment.

8. The Seedling

The protracted germination period makes it difficult to give a true picture of the development of a batch of seedlings, and the following description [64] is based on individual examples. After their withdrawal from the testa, the pale yellow cotyledons (oblong to obovate in shape) spread and turn pale green. Before they are shed they may attain over one inch in length. In its immediate post-germination stages the plant is fleshy, turgid and brittle. The developing shoot carries up to about 6 simple (more strictly, unifoliolate) leaves arising in the axils of the bud scales of the plumule. The

size of these leaves when mature increases upwards on the shoot. When the shoot is one inch, the hypocotyl one inch, the radicle 3, and its laterals 0·3 inches long, two of these simple leaves may have spread, and this may occur about 8 weeks from sowing. When the shoot, radical and lateral roots are respectively 2, 4·5 and 0·5 inches long, all 6 simple leaves have developed; and when the shoot, root and lateral roots reach 4·5, 17 and 5·0 inches, 3 compound leaves may have developed and a fourth appeared (16 weeks from sowing). At this stage, root nodules become obvious but no taproot has developed. At the end of 12 months, which covers a dry season in which growth has stagnated, the majority of seedlings are 6–9 in. high, with some up to 27 in. The root-collar diameter is $\frac{3}{8}$ in. [64]. In the wild, a seedling of the current season can, if young enough, be recognized by its cotyledons, or by unifoliolate leaves of increasing size on a short shoot; and later in the season by a single leafless shoot up to 30 in. high and to $\frac{3}{8}$ in. in diameter at the root collar. Doubtful cases would require the the exposure of the base of the shoot, to eliminate plants with shoot scars of previous years.

Part II and bibliography will appear in the next number.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 273, 780, 869–70, 875, 898–9, 986, 1027, 1037, 1130.

0 (048.1). Bibliographical Lists

See also Nos. 102, 134, 707, 779, 860, 1015, 1039.

1. THIRGOOD, J. V., and NIGOGOSIAN, A. G. **Research Record No. 4. A Cyprus forest bibliography 1879–1956.** *Tech. Pamphl. For. Dep. Cyprus* No. 21, 1956. pp. 9.

2. HULME, M. I. **Bibliography on the utilization of the Eucalypts (classified by the Oxford Decimal System for Forestry) prepared for the FAO World Eucalypt Conference, Rome 1956.** Division of Forest Products, C.S.I.R.O., South Melbourne, Victoria. 1956. pp. 129 + xii.

Consists of ca. 1500 references under O.D.C. head 8, collected by the Division during its 25 years' existence and supplemented from *Bibl. Agric. U.S. Dep. Agric.* and *F.A.*, plus > 300 references under other O.D.C. heads. Predominantly Australian, they have not been selected critically. Internal progress reports of Australian departments are excluded. There is an index.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

3. ***Anales de la Administración Nacional de Bosques.*** Dirección de Investigaciones Forestales, Administración Nacional de Bosques, Ministerio de Agricultura y Ganadería, Buenos Aires.

The first of an annual series covering work in all branches of Argentine forest research. The first number, published in 1956, contains 176 pages and presents articles on tanstuffs, shelterbelts, properties of native species, Eucalypts in Argentina, and fire hazard. Citation in *F.A.*: *An. Adm. nac. Bosques, B. Aires.*

0 (084.3/4). Maps. Atlases

See also Nos. 170, 261.

4. GAUSSEN, H., and PHILIPPIS, A. DE. La limite euméditerranéenne et les contrées de transition. [**[Map of] the true Mediterranean limit [marked by the presence of Olives] and transitional countries.**] Joint Subcommittee on Mediterranean Forestry Problems, F.A.O. [*n.d.*] 1 sheet. [F.] Scale 1:5,000,000. [Cf. *F.A.* 17 No. 3749.]

5. Lesnický a myslivecký atlas. [**An atlas of forestry, game and fishing.**] Ústřední Správa Geodesie a Kartografie, Prague. 1955. pp. 91 + 15 + 120 maps. [Cz.]

Includes forest and game maps of Czechoslovakia, maps of forest areas of Europe and the U.S.S.R., and maps of the distribution of tree species in Europe, Asia, and N. America. The index is in English, German, Russian and Czech.

0 - - 011. Terminology. Nomenclature

See Nos. 130, 714, 725, 841, 873.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

6. ROUSSEL, L. Sur quelques récentes études de photologie forestière. [**Some recent studies on light in the forest.**] *Rev. for. franç.* 8 (7), 1956 (512–4). 6 refs. [F.]

Reviews recent studies on the influence and measurement of relative illumination.

111.5. Wind

See Nos. 11–2, 447–8.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

See also Nos. 10–1, 14.

7. LOWRY, W. P. **Evaporation from forest soils near Donner Summit, California, and a proposed field method for estimating evaporation.** *Ecology* 37 (3), 1956 (419–30). 11 refs.

A mathematical extension of the vapour-pressure-deficit equation is developed, leading to a much simplified method of making field approximations. If a soil-filled pan is placed level with the soil surface and weighed periodically to obtain a measure of evaporation, and a hygrograph giving a continuous humidity record is placed beside the pan, it is shown that the area under the humidity trace on the chart and between the beginning and ending times of the observation period yields a straight-line relationship

when plotted on log-log graph paper against the evaporation measured for the same period. *From author's summary.*

111.8. Climatology. Climate and Microclimate

See also Nos. 170, 199, 263.

8. **[Climate and ecoclimate in the Belgian Congo.]** *Rapp. Inst. nat. Étude agron. Congo belge 1954*, 1955 (143–60). [F.]

The installation of 14 new stations brings the total of first-, second-, and third-order stations to 17, 11 and 23 respectively. Yangambi publishes 12 tables covering [for rain-forest climate] rainfall, insolation, radiation, temperature, relative humidity, vapour tension, saturation deficit, evaporation, atmospheric pressure and wind velocity.

9. KORTÜM, F. Klimaschwankungen der Gegenwart. **[Climatic variations of the present time.]** *Arch. Forstw.* 4 (5/6), 1955 (569–77). 10 refs. [G.g.]

Presents graphs of the variation from the mean of the seasonal and annual temperature at de Bilt, Berlin and Vienna from 1761 to 1950 and the rainfall at 14 German stations for 1851–1950, and gives tendency maps for the air pressure, temperature and rainfall of W. Europe, showing the variations in 1949–54 from the means for 1901–30. A maximum rise in mean annual air temperature of 2° [C.] lies over the Barents Sea, a strip of higher rainfall stretches from Greenland over S. Scandinavia to the Mediterranean with a maximum of 140% over the North Sea. A fall of pressure in the Iceland lows and a rise in the Azores highs indicate an increase in southern air circulation which is shown to occur in all seasons but particularly in spring.

10. GREEN, F. H. W. **Climatological work in the Nature Conservancy.** *Repr.* from *Weather, London* 10 (7), 1955 (233–6).

Includes notes on ant populations on forest floors, penetration of raindrops to forest floor, and macroclimatic studies in connexion with natural regeneration of Pine in Scotland.

11. KREUTZ, W. Geländeklimatische Untersuchungen im Bereich von Windschutzanlagen des Westerwaldes. **[Investigations of microclimate in the wind-protected belt of the Westerwald.]** *Forstarchiv* 25 (9), 1954 (211–5). [G.g.]

A report on initial 3-day observations in mature Spruce stands—wind velocities at 1·3 m. above ground, temperatures, dewfall and snow distribution —supported by ground diagrams.

12. MARSTON, R. B. **Air movement under an Aspen forest and on an adjacent opening.** *J. For.* 54 (7), 1956 (468–9). 3 refs.

Anemometer measurements of air movement were obtained during the summer of 1948, (*a*) under low Aspen forest (above ground vegetation and below the tree canopy) and (*b*) in an opening (70 × 200 ft.) in the same forest and with similar ground vegetation. Both sites were fully exposed to the prevailing westerly winds. A total of 83 readings was made on each anemometer from 1 July to 13 Oct. Total air movement for the season was 4 times as much in (*b*) as in (*a*). Air velocities for the season averaged 3·29 m.p.h. in (*b*) against 0·72 m.p.h. in (*a*). For individual pairs of readings the reductions in (*a*) varied from 1·76 to 4·10 m.p.h., and were directly and highly correlated with velocities in the open. None of the velocities recorded during the study exceeded 6 m.p.h.

13. KEEN, F. P. **Low temperature differentials in one forest drainage.** *Ecology* 37 (2), 1956 (381–3). 6 refs.

Experimental measurements made inside a Ponderosa Pine forest in rough mountainous country and at a permanent meteorological station in a town some 27 miles away (Princeville, Calif.) indicate that low-temperature readings at the latter give a fairly adequate indication of conditions in the forest, e.g. whether temperatures are likely to be lethal to bark beetles.

14. BAGNOULS, F., and GAUSSEN, H. Saison sèche et indice xérothermique. **[The dry season and the xerothermic index.]** *Documents pour les Cartes des Productions Végétales, Faculté des Sciences, Toulouse* (*Sér. Généralités*) Vol. 1, tome 3, art. 8, 1953. pp. 47 + 1 map. 43 refs. [F.]

Discusses (1) the definition and determination of a 'dry season', with particular reference to the western Mediterranean region; (2) the conception, value and determination of a 'xerothermic index', with applications to the same region. By the xerothermic index is meant the number of biologically dry days occurring in a year. This is in effect the number of days without measurable rainfall, but weighted to take account of fog, dew, and atmospheric humidity (i.e. rainless days with fog or dew are counted as ½ not as 1 dry day, and there is a similar scale for different degrees of relative humidity). Xerothermic indices and other climatological data are tabulated for a large number of stations in the western Mediterranean and, for comparative purposes, some tropical stations. Sites with identical annual rainfall but different xerothermic indices provide very different environments. Notes are given on a number of tree species of limited range, showing the effect of this index on their distribution. Species noted are *Quercus ilex, Q. suber, Q. coccifera, Pinus halepensis, Pistacia lentiscus, P. atlantica, Tetraclinis articulata, Juniperus phoenicea, Zizyphus lotus, Cupressus dupreziana, C. lereddei*, and *Olea europaea.*

114. Soil. Soil Science

15. WALTERS, R. S. **A soil tube extractor.** *Sta. Note Cent. St. For. Exp. Sta.* No. 95, 1956. pp. 2.

Describes the adaptation of an ordinary car jack to extract soil tubes from the soil when taking samples for moisture studies.

114.1. Soil Physics

See also Nos. 29, 34, 191, 240.

16. TARRANT, R. F. **Changes in some physical soil properties after a prescribed burn in young Ponderosa Pine.** *J. For.* 54 (7), 1956 (439–41). 8 refs.

A light surface burn over a very light sandy soil of medium texture resulted, under the conditions studied, in slightly improved permeability and associated physical properties. The former is ascribed to the burning out of small roots, providing better percolation channels.

17. SCOTT, V. H., and BURGY, R. H. **Effects of heat and brush burning on the physical properties of certain upland soils that influence infiltration.** *Soil Sci.* 82 (1), 1956 (63–70). 12 refs.

Two slightly acid soils, the commonest in about 10 million acres of California brush, both weathered *in situ*, (*a*) from shale and (*b*) from basic igneous rocks, were tested in columns (3 × 5 in.) of top-soil for the effects of heat plus ash. Treatment consisted of burning the equivalent of 110 tons dry material/acre (the maximum found) and recording temperatures and their duration at $\frac{1}{16}$–$\frac{1}{8}$ in. deep. Columns 1·5 × 3·25 in. were then oven-heated to similar temperatures and for similar durations. Both heat and brush burning produced measurable changes in aggregation and permeability in the top-soil of (*a*), which lead to appreciable increases in infiltration rates; on (*b*) the effects were not so pronounced.

18. MANSON, P. W., and MILLER, D. G. **Groundwater fluctuations in certain open and forested bogs of Northern Minnesota: with notes on the effects of open drainage ditches on swamp forest growth.** *Tech. Bull. Minn. agric. Exp. Sta.* No. 217, 1955. pp. 29.

The studies covered in this bulletin were initiated in 1926, primarily in order to determine the economic possibilities of stimulating tree growth in the forested bogs of N. Minnesota. In the present report, emphasis is laid mainly on groundwater fluctuations rather than on tree growth.

114.2. Soil Chemistry

See also Nos. 22–6, 29, 34, 191, 197–201, 256.

19. RENNIE, P. J. **A semi-micro routine procedure for the partial fractionation of soil phosphorus.** *Repr.* from *J. Sci. Food Agric.* 7 (3), 1956 (227–32). 20 refs.

The procedure, developed for agricultural, forest and moor soils, including peats, sands and clay, and varying markedly in pH and nutrient status, uses a semi-micro adaptation of McClean's acid attack for the extraction of total P, and Williams' extractants for the initial fractionation. After preparatory treatment of the extracts, P is determined colorimetrically.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 29, 35–9, 196–201, 256–7.

20. ZONN, S. W. Die biogeozönotische Methode und ihre Bedeutung für die Erforschung der Rolle der biologischen Faktoren in der Bodengenese unter Wald. **[The biogeocoenosis method and its importance in the study of biological factors in soil development under forest.]** *Arch. Forstw.* 4 (5/6), 1955 (578–87). 20 refs. [G.]

A general discussion detailing the need for complete studies of all the factors of the forest biogeocoenosis with more particular reference to podzols and their origin. [Cf. *F.A.* 15 No. 2202.]

21. DIMBLEBY, G. W. **The importance of historical checks in interpreting the effect of vegetation upon soil development.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/16, 1956. pp. 6. 3 refs.

Pollen analysis of normal forest soils, provided that they are acid enough, can be a valuable source of information concerning the past history of a site, expressed in broad terms. A few examples are given showing how the status of forest can be determined by this technique. Two of these cases were sites which appeared to be of considerable value in relation to the effect of species on soil. One of these, an Oak wood in the New Forest, appeared, from its soil characters, to be derived directly from a pre-heath era: the other, a Birch stand in Yorkshire, showed the development of incipient mull in a heath podzol, apparently due to the influence of the Birch. Both stands are shown here to have had a grassland phase which renders untenable the construction which had been put upon them. This technique could usefully be applied as a test to many forest sites selected for comparative soil studies. The historical aspect has too often been neglected through inadequate means of assessing it. [Cf. *F.A.* 17 No. 2592.] *Author's summary.*

22. VIRO, P. J. **The role of silica in the decomposition of forest humus.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *B*, 1956 (723–6). 2 refs. [E.e.g.f.]

Spruce and Larch needles and humus from different depths in 70-year stands were analysed for their content of SiO_2. This increased steadily with increasing age of litter and, to some extent, of humus. It is suggested that the slow decomposition of certain kinds of litter is due in part to their high SiO_2 content, believed to occur in the form of silicic acid and silicates difficult to dissolve. The grass vegetation in Larch stands generally induces faster decomposition of litter, but an admixture of broadleaved species is desirable with Spruce.

23. BURGES, A. **The release of cations during the decomposition of forest litter.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *B*, 1956 (741–5). 3 refs. [E.e.g.f.]

Ash analyses were made of fresh 'needles' (photosynthetic shoots) of *Casuarina suberosa* from trees immediately above the area sampled and of samples from 5 layers of the litter, ranging from the surface to the lowest layer > 6 cm. below, and from the top 1 cm. of the soil. The figures were then recalculated, on the assumption that no Fe was lost from the needles during decomposition, to show the absolute loss rate during the 3 years of decomposition represented by the depth of the litter. Results are given in a table and graph showing the amounts of the different cations at various stages, expressed as a % of amounts in the green needles. A large proportion of Na, N, and PO_4 and small amounts of

Ca and Mg are washed out as soon as the cells of the needles die. Ca is released in two phases, the greater part remaining until cellulose and lignin are decomposed by fungi. There is some evidence that part of the Mg and PO_4 washed out from the uppermost layer of the litter is caught and held lower down.

24. BLOOMFIELD, C. **Soil chemistry: a study of leaf leachates.** *Rep. Rothamst. exp. Sta. 1955*, 1956 (64–5).

Points dealt with include podzolizing properties of Kauri and Rimu bark and leaves; joint action of simple carboxylic acids and reducing agents in leaf extracts; artificial production of podzolization in columns of quartz; and deflocculation of kaolinite suspensions by leaf extracts. [Cf. *F.A.* 17 Nos. 2390, 3583.]

25. BLOOMFIELD, C. **The deflocculation of kaolinite by aqueous leaf extracts. The role of certain constituents of the extracts.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *B*, 1956 (27–32). 4 refs. [E.e.g.f.]

[Cf. *F.A.* 17 No. 2390.] A detailed study of extracts from different species showed that, although their action on kaolinite was very similar, the compounds responsible varied with the species. The activity of extracts of leaves of *Dacrydium franklinii* appeared to be caused by their polysaccharide content and that of barks of *Agathis australis* and *D. cupressinum* by polyphenols. The active constituents of Aspen leaf extracts include a polysaccharide and an acid of high molecular weight, both active dispersing agents that separately give little or no reflocculation at high concentration; when they act together, however, an antagonistic effect becomes apparent, with a greater degree of reflocculation. *From author's summary.*

26. BLOOMFIELD, C. **The solution-reduction of ferric oxide by aqueous leaf extracts. The role of certain constituents of the extracts.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol *B*, 1956 (427–32). 3 refs. [E.e.g.f.]

[Cf. *F.A.* 17 No. 3583.] Experiments with leaf extracts of Rimu and Kauri showed that the constituents of larger molecular weight inhibit the activity of those of smaller molecular weight in dissolving Fe oxide. The addition of the bark extract of Rimu or Kauri to the appropriate leaf extract reduced the amount of Fe oxide dissolved, the Rimu bark much more than the Kauri bark. The Fe-dissolving properties of an Aspen leaf extract were considerably modified by treatment with exchange resins. Comparison of Scots Pine needles stored for several months with fresh material showed that the former had a much lower content of reducing compounds, possibly as a result of partial oxidation during storage.

27. HARTMANN, F. Über die Bedeutung des Waldhumus als Keimbett. **[Forest humus as a seedbed.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/21/102, 1956. pp. 2. [G.]

Discusses the classification of humus formation into 4 basic types: zoogenous, aerobic fungal, anaerobic, and sphagnum, and the various humus forms, or stages of development, and stresses the need for detailed analyses of humus horizons for the assessment of their value as seedbeds for natural regeneration.

114.4. Soil Classification. Soil Types

See also Nos. 20, 24–6, 35, 196, 201, 257, 1172.

28. GUPTA, R. S. **Soil survey and soil classification in India with special reference to forest conditions.** *Indian For.* 82 (3), 1956 (107–13). 16 refs.

Gives a brief account of work hitherto done, and suggests a tentative broad classification of Indian soils as follows: I. *Himalayan and Siwalik regions*: (1) podzols mainly under conifers, (2) brown forest soils, brown earths. II. *Indo-Gangetic alluvium*: (1) deltaic alluvium, (2) desert deposits, (3) subrecent formations (*bhabar* and *tarai*), (4) saline and alkaline soils, (5) yellow and brown soils. III. *Deccan plateaux soils*: (1) red soils, (2) laterite, (3) black cotton soils.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 32–3, 193, 244, 264, 747–51, 755, 759, 1201–2.

29. EHWALD, E., *et al.* Standortkundliche Untersuchungen an diluvialen Sandböden in der Lehroberförsterei Finowtal. **[Site-factor researches on diluvial sands in the Finowtal instructional forest.]** *Arch. Forstw.* 4 (5/6), 1955 (481–500). 8 refs. [G.]

Compares in detail 3 closely situated and apparently similar sites, two of which are podzolized brown earths and one a moderately developed podzol. The first two lie on a Beech/Sessile-Oak type and carry, the one a 55-year Pine stand of mean height 17 m., the other 100- to 130-year Beech of mean height 24 m.; the third, on a Pine/mixed-forest type has 75-year Pine of mean height 14·3 m. The data cover mechanical and mineral composition, humus status in tons/ha. and its N content, acidity, organic matter and easily soluble Ca, K and P, water storage (mm.) in the upper 0·25 and 1·0 m., from March to November, soil moisture % in June and July, at 10, 25 and 50 cm., mean temperatures under litter and at 10 cm. for June to October, and fine-root distribution through the profile. On the basis of these data, the probable history of each site is outlined and recommendations are made for improvements—ploughing, basic slag, N-fixing plants etc.—and for the lines that further investigations should follow.

30. LEAF, A. L. **Growth of forest plantations on different soils of Finland.** *For. Sci.* 2 (2), 1956 (121–6). 12 refs.

A study of the relationships between growth and soil composition, nutrient content of foliage and floristic type (Cajander) in N., Central and S. Finland, carried out in 9 *Picea abies* and 20 *Pinus sylvestris* plantations, aged 20–50 years.

114.6. Soil Biology

See also Nos. 202–4, 577.

31. BONNIER, C., BROUWERS, L., and MANIL, P. Analyse microbiologique du sol: problèmes et méthodes. [**Microbiological analysis of the soil: problems and methods.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (73–9). 10 refs. [F.f.g.e.]

Describes methods and results from soils from two Beech woods, one fast- and the other slow-growing.

32. EHWALD, E., KUNDLER, P., and HÜBNER, E. Erfahrungen mit der Reisstestmethode von F. Richard zur Bestimmung der biologischen Bodenaktivität. [**F. Richard's tensile-strength method of determining biological activity of the soil.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (39–44). 1 ref. [G.g.e.f.]

The method [cf. *F.A.* 8 No. 59], when tested in forest soils near Eberswalde, proved satisfactory for soils with distinct but not extreme differences in humus conditions, only with sufficient repetitions and for periods of several years; results from only one plot or for one year were very erratic. *From authors' summary.*

33. LAVERGNE, D., and POCHON, J. Activité microbiologique de quelques mulls forestiers. [**Microbiological activity of some forest mulls.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (355–8). 2 refs. [F.f.g.e.]

Results of laboratory studies on denitrification and the consumption of tyrosine by micro-organisms of different soils under Sessile Oak and Beech are shown in diagrams.

34. BIRCH, H. F., and FRIEND, M. T. **Humus decomposition in East African soils.** *Nature, Lond.* 178 (4531), 1956 (500–1). 2 refs.

Describes a modified macro-respirometer which sensitively reflects the magnitude of organic-matter decomposition over any desired period. With soil samples so far tested in this apparatus, organic-matter decomposition followed a first-order reaction, i.e. the rate of decomposition decreased with time and was proportional to the amount of decomposable material present. The decrease was shown not to be due to fall in pH, to accumulation of toxic products, or to the adverse effect of the respirometer environment on microbial activity. Among the results so far obtained, the following are of particular interest. When a soil was air-dried and re-wetted, an appreciable flush of decomposition resulted, and further successive dryings and re-wettings produced effects similar in magnitude, rate of decomposition, and kind of organic matter decomposed. The effect lasted for about 5 days. The drying effect was shown to be unrelated to microbial stimulation, destruction of toxic compounds, release of N, P and K, or microbial death with subsequent decomposition of the remains. All the evidence available indicates that the drying effect is one of liberation from the clay of rapidly decomposable material which, under steady moist conditions, is protected by the clay from microbial attack. A single air-drying of a forest soil (5·4% C) liberated rapidly decomposable organic material equivalent to 0·011 g. C/100 g. soil (or 220 lb./acre—6 in.). These results indicate that at least part of the humus fraction under moist conditions is protected from, but not inert to, microbial attack. When it is released, either through drying or through displacement by other organic compounds, it is rapidly decomposed. Further, since decomposition generally parallels NH_3 accumulation, there should be a quick release, through mineralization, of nitrate and other nutrients. Such behaviour has an obvious bearing on (*a*) the seasonal pattern of humus decomposition, (*b*) the nitrate flush that occurs at the start of the rains and is related to the degree of soil drying, and (*c*) the beneficial effects, so often reported, of burning.

35. DOMMERGUES, Y. Modifications de l'équilibre biologique des sols forestiers. [**Modifications of the biological equilibrium of forest soils.**] *Mémoires de l'Institut Scientifique de Madagascar, Tananarive* 6*D*, 1954 (115–48 + 1 plate). 13 refs. [F.f.] H.S.B.

A series of investigations on various sites in central and eastern Madagascar led to the conclusion that soils can be classified into two main groups, with (1) an unstable, and (2) a stable, biological equilibrium, but that many intermediate types exist. (1). Species composition of the forests has a marked influence on these soils. Disappearance of the forest produces a break-down in biological activity. Characteristic of this type among the soils studied were soils of podzolic evolution and old alluvial soils. (2) Species composition of the forests has practically no influence on biological activity. Neither the disappearance nor the establishment of forests produces any marked change. Characteristic of this type were recent alluvial and colluvial soils. Of the intermediate types the most important were lateritic clays on gneiss and lateritic clays on basalt, the latter being on the whole more stable. [Cf. *F.A.* 17 No. 2399.]

36. JACQUEMIN, H., and BERLIER, Y. Évolution du pouvoir nitrifiant d'un sol de Basse Côte d'Ivoire sous l'action du climat et de la végétation. [**Changes in nitrifying activity in a soil in the Basse Côte d'Ivoire under the action of climate and vegetation.**] *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (343–7). 8 refs. [F.f.g.e.]

A 2-year study on sandy soil, (1) forest-covered, (2) bare, and (3) under shrubs (forest fallow), showed that the activity of NH_4-oxidizing bacteria is far higher in (3) than in (2) and is closely related to rainfall fluctuations; it is always low, with but little variation, in (1). The activity of NO_2-oxidizing bacteria varies less between (1), (2) and (3). Conclusions are that nitrifying activity is low under forest, increases with felling, disappears rapidly if the soil remains bare, and reaches its maxima during the 2 rainy seasons.

37. MORANI, V. Observations effectuées en Italie sur l'évolution du sol produite par les *Eucalyptus*. [**Studies made in Italy on the influence of Eucalypts on the profile [in a sandy soil].**] [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt.*

Subcomm. Medit. For. Probl., Nice 1956 No. *FAO/SCM/EU/7-C* 1956. pp. 5. [F.]

Discusses and criticizes the methods laid down by the working party for obtaining undisturbed soil samples, the great variability in results even from the same site, and methods for determining free Fe oxide in forest soils. Preliminary results of bacteriological determinations indicate that Eucalypt plantations display a marked diminution in numbers of micro-organisms generally, but an increase in *Azotobacter chroococcum*, with a corresponding increase in ammonification at all levels below the A_o and A_{oo} horizons. [Cf. *F.A.* 17 No. 3579.]

38. MILOSEVIC, R. S. L'effet de la végétation sur la microflore des sols sablonneux dans la région des sables de Déliblato (1). **[The effect of vegetation on the microflora of sandy soils in the region of the Deliblato sand dunes.]** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (115–20). 13 refs. [F.g.e.]

Samples were examined from 3–4 depths of bare sand dune and sites representing different types of vegetation, including plantations of *Pinus nigra* and *Robinia pseudoacacia*. The number of micro-organisms was very high in the forest litter, especially in that of *R. pseudoacacia*, but comparatively low in the soil, differences in quantity between the two species being less than in the litter. Under *R. pseudoacacia*, heterotrophic bacteria, actinomycetes, and ammonifying organisms predominated; under Pine, moulds and spore-forming bacteria. In all samples the number of micro-organisms decreased with increasing depth.

39. GYLLENBERG, H., and HANIOJA, P. **The 'rhizosphere effect' of graminaceous plants in virgin soils. III. Comparison with the effect of other plants.** *Physiol. Plant., Copenhagen* 9 (3), 1956 (441–5). 5 refs.

Rhizosphere and control samples were taken in July–August, 1954 and 1955, from the A_o and B horizons of 3 forest soils: (1) *Oxalis-Myrtillus* type Birch; (2) *Myrtillus* type Spruce; (3) *Vaccinium* type Pine. The roots of trees and shrubs exerted a negative 'rhizosphere effect' in the A_0 horizon, but in the B horizon Birch, Spruce and *Vaccinium vitis-idaea* had a stimulating effect on soil bacteria. Nutritional testing of isolates from each A_0 sample (25–30 cultures) showed that the woody parts of tree and shrub roots inhibited, whereas *Deschampsia* stimulated, bacteria requiring amino-acids as essential nutrients; and both, but especially *Deschampsia*, stimulated, on soils from (1) and (2), bacteria that grew on Gyllenberg's basal medium and that required both amino-acids and B vitamins as essential nutrients; on soils from (3) tree and shrub roots had little or no effect.

40. JONESCU, M. A. Sur la faune détritique et son importance pratique. **[The litter fauna and its practical importance.]** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (299–306). 12 refs. [F.g.e.]

Compares results (from literature and original research) from studies in Rumania on the quality and variety of fauna in litter of Oak, Beech and Larch forests, alpine pasture, floating islands in the Danube delta, and forest protection regions.

41. BLOWER, J. G. **Some relations between millipedes and the soil.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *C*, 1956 (169–76). 22 refs. [E.e.g.f.]

Includes diagrams showing the vertical and horizontal distribution of different common English millipedes on different soils and under different cover vegetation.

114.7. Soil Surveys and Surveying

See Nos. 28, 42.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 10–1, 16–8, 199, 263, 393–8, 412, 439, 442, 524–5, 1162.

42. **Water.** *Yearb. Agric. U.S. Dep. Agric. 1955* [1956] pp. xiii + 751. Many refs. Price $2·00.

Contains a section on 'Water and our Forests' with the following articles: Trees also need water at the right time and place (*G. L. Hayes* and *S. H. Buell*); How to get more snow water from forest lands (*B. C. Goodell* and *H. G. Wilm*); Managing forests to control soil erosion (*E. G. Dunford* and *S. Weitzman*); and Soil survey on forest and range lands (*J. L. Retzer* and *E. A. Colman*).

43. MOLTSCHANOW [MOLČANOV], A. A. Der Wassererhaltende und -schützende Bedeutung des Waldes. **[The water conserving and protective function of the forests.]** *Arch. Forstw.* 4 (5/6), 1955 (591–607). [G.]

A general review, supported by data mainly from Russia, on the water cycle, separating the effects by forest species and types, ground-cover species and types, stands of different species at different ages, forest openings of various widths in relation to snow etc. Silvicultural methods of regulating the water storage function of forests, particularly against run-off from heavy rain and snow melt and the prevention of flooding, are indicated for some general cases.

44. ISHIKAWA, M. **[Snow survey in the Toyohira River watershed.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (124–38). 3 refs. [Jap.jap.e.]

Detailed observations in March and April, 1955, on (*a*) depth, (*b*) density and (*c*) the water equivalent of snow, show that on a N.E. slope the values of (*a*) and (*c*) decreased in the order: open ground, sparse hardwoods, fairly large glades surrounded by conifers, small openings in dense hardwoods, conifers. In all conditions (*b*) was almost constant (0·292 g./c.c. in March; 0·441 in April).

45. KONDA, K. **[Influences of frost on spring flood. 1. Non-freezing spots in frozen forest floor.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (647–58). [Jap.e.]

In a Hokkaido forest, where 30–50 cm. of snow lies, soils freeze to 18 cm. under hardwoods and 33 cm. in the open. In the open especially, the rapid spring thaw favours run-off. In an area, 50 × 20 m., of dense hardwoods, 29 or more spots remained unfrozen, a further factor encouraging infiltration and reducing run-off.

46. MURAI, N. **[A study of snow-cover and frozen soil in relation to slope erosion.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (769–92 + 28 photos). 44 refs. [Jap.e.*e.*]

Tables and graphs from a 2-year study near Hokkaido show air and soil temperatures, precipitation, snow cover and depth of freezing, in 3 sites differing in vegetation, aspect, end slope, and their erosion loads, summer and winter. Both snow cover and depth of soil-freezing influence the winter, and even more the summer, erosion.

47. DILS, R. E., and AREND, J. L. **Snow accumulation under Red Pine of different stand densities in Lower Michigan.** *Tech. Note Lake St. For. Exp. Sta.* No. 460, 1956. pp. 2.

Winter snow accumulation under a plantation of *Pinus resinosa* was found to vary with stand density. Late winter snow depth averaged respectively 11, 9 and 8 in. for stand densities (b.a./acre) of 80, 120, and 190 sq. ft., whereas the depth in an open field near by was 17 in. Averages were taken from a total of 15 measurements made from January to March 1954 and in February 1955.

48. SARTZ, R. S., and TRIMBLE, G. R., JR. **Snow storage and melt in a northern hardwoods forest.** *J. For.* 54 (8), 1956 (499–502). 6 refs.

Snow depths were measured at intervals during March and April in clear-felled openings and adjacent forest on gentle N. slopes in typical sawtimber and pole stands (80 and 60 ft. high) in the White Mountains, New Hampshire. Snow in the clearings was 21–28% deeper, and held 4–10% more water; snow in the forest was 18–26% denser. Melting was fastest at the northern end of the clearings, and began when the density of snow reached ca. 30%. The implications of the findings are discussed.

49. TAMM, O. L'évapo-transpiration dans la région forestière de la Suède. **[Evapo-transpiration in the forested region of Sweden.]** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *B*, 1956 (15–20). 6 refs. [F.g.e.]

Graphs, based on data from 25 catchment areas, show a straight-line relationship between evapotranspiration (E) and mean annual temperature (T); the equation $E = 30{\cdot}4T + 220{\cdot}9$ is derived from them. A table gives values of T,P (precipitation), E, and $P - E$ in different parts of Sweden. The use of $P - E$ as an index of humidity is discussed.

50. LAURIE, M. V. **The effect of forests in water catchment areas on the water losses by evaporation and transpiration.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/16, 1956. pp. 4. 7 refs.

Discusses the difficulties involved in attempting to measure evapotranspiration of forest and other types of vegetation, with particular reference to conditions in Great Britain.

51. KIRWALD, E. Über Wald und Wasserhaushalt im Ruhrgebiet. **[Forests and the water regime of the Ruhr area.]** Ruhrtalsperrenverein, Essen. 1955. pp. 104 + 17 tables + 66 sketch-maps, gphs. and dgms. in suppl. 27 refs. [G.]

A general description of the region and its climate; the geology, pedology, topography and vegetation of the 7 hydrological experimental areas of 21–333 ha., established in 1949; and the scope and methods of observation including the use of radioactive isotopes to trace the passage of water through the soil. All areas are in hilly or mountainous country; two have little or no forest, two are predominantly Spruce, two partly broadleaved, partly coniferous high forest, and one is mixed coppice. Detailed data on run-off, streamflow etc. for the years 1951 to 1953 are presented and discussed. No conclusions regarding forest influences, apart from the equalizing effect on streamflow, can yet be drawn.

52. GARCIA NÁJERA, J. M. Influence de la forêt sur le régime des eaux. **[Hydrological influence of the forest.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/11/17, 1956. pp. 4. [F.]

A theoretical discussion of the mechanical effect of forest vegetation in checking run-off and erosion and increasing infiltration during heavy rainfall on a slope.

53. KATSUMI, S. **[Variation of flow in the period before and after cutting at Kamikawa experimental forest (1).]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (139–49). 9 refs. [Jap.jap.e.]

A comparison of two catchments of about 600 ha. each, (*a*) natural mixed forest and (*b*) primeval forest of *Abies mayriana*/*Picea jezoensis*/hardwoods, in which (*a*) lost, during 1944–49, 45% of its volume in selection fellings, shows that (*a*) had an increased flow of 32·19 and 87·74 mm. [rainfall equivalent] in the summer and winter respectively. Various regressions e.g. for run-off and evaporation and comparing the monthly summer and winter run-off before and after cutting are given.

54. BHATTACHARYA, A. P. **Study of the effects of deforestation on the intensity and frequency of rainfall and floods in Pathri, Ranipur and Ratmau torrents.** *Indian For.* 82 (8), 1956 (411–5).

A study was made of these Himalayan torrents, for whose catchments data were available on streamflow, rainfall and forest management. Planned and limited clear felling was having no effect on the first two, but there was some increase in frequency (not intensity) of floods on the last. There was no effect on rainfall.

55. WHITMORE, J. S. **Water in relation to plant growth.** *J. S. Afr. For. Ass.* No. 27, 1956 (36–42). [E.]

In the humid areas of S. Africa, where weather rather than plant cover governs evapotranspiration, there are two water-yielding areas comprising 35,000 sq. miles (5% of the area of the Union), which contribute about 60% of the country's run-off. Here water should be considered the most important product. Data from the Coweeta catchments are quoted to show that maximum infiltration is the key to greater and better water production in humid catchments, and that for this purpose forest litter is probably unsurpassed.

56. BEARD, J. S. **Results of the Mountain Home rainfall interception and infiltration project in Black Wattle 1953/54 [and some correspondence on the subject].** *J.S. Afr. For. Ass.* No. 27, 1956 (72–85, 92–5). 6 refs. [E.e.afrik.]

Interim results and estimates are reported for total rainfall, interception, throughfall, stemflow and run-off in a plantation compared with ungrazed grassland. A letter of criticism by C. L. Wicht and the reply add information. [Cf. *F.A.* 17 No. 58.]

57. NÄNNI, U. W. **Forest hydrological research at the Cathedral Peak Research Station.** *J. S. Afr. For. Ass.* No. 27, 1956 (2–35). 49 refs. [E.e.afrik.]

Describes in detail the site factors, vegetation and catchment characteristics of a summer-rainfall area where 9 catchments (65–470 acres each) have been laid out for 'whole catchment research', with weirs and subsidiary recording of infiltration, evapotranspiration and interception. Six catchments are being planted with *Pinus patula* at 8-year intervals (1951–1991), to within one chain of stream margins. One catchment will be planted up to stream margins, one grazed intermittently for 5 years before planting, and one left to natural succession. [Cf. *F.A.* 17 No. 3598.]

58. RYCROFT, H. B. **The effect of riparian vegetation on water-loss from an irrigation furrow at Jonkershoek.** *J. S. Afr. For. Ass.* No. 26, 1955 (2–9). 16 refs.

Flow was measured in a furrow capturing the water of 5 streams during a hot rainless period 12 days before and after 1600 yards of its banks had been cleared of vegetation [mainly grass] to a distance of 3 yards. The daily loss in thousands of gallons was computed from the difference between a smooth curve joining points of maximum diurnal flow (about 9 a.m.) and the actual flow recorded throughout the day. A table shows the maximum temperature and the water loss for each of the 12 days before and after removing the vegetation, and linear regressions for daily loss and temperature are graphed for both conditions. There was a highly significant saving of water after clearing.

59. JOHNSON, E. A., and KOVNER, J. L. **Effect on streamflow of cutting a forest understorey.** *For. Sci.* 2 (2), 1956 (82–91). 11 refs.

Compares the streamflow in both dormant and growing seasons after cutting the Laurel and Rhododendron undergrowth in predominantly Oak/Hickory forest with that of an uncut control, in two catchments of the Coweeta Hydrologic Laboratory, N. Carolina, with annual rainfall of 80 in. The cutting of the undergrowth increased annual streamflow by 2 in. during the first 6 years, corresponding to a decrease of 2 in. in the evapo-transpiration, since change in water storage was nil. The effect decreases with the years, as the undergrowth recovers. This ground-cover type occurs in 1·5 million acres of hardwoods in the S. Appalachian Mountains.

60. **Influences of reforestation and erosion control upon the hydrology of the Pine Branch watershed, 1941 to 1950.** *Tech. Monogr. Tenn. Vall. Auth.* No. 86, 1955. pp. vii + 95.

This typical deforested, eroded catchment, selected for hydrological research in 1941, had half its area idle and severely eroded, less than a quarter under poor forest, and the remainder cultivated or eroded pasture. Treatment for erosion control began in 1945 (check dams, diversion ditches, contour furrows etc.), followed by extensive planting of trees in 1946. Data from hydrological studies for 5 years before and 5 after treatment are presented in detail and discussed. Surface run-off volumes have decreased and ground-water discharges increased; there is some indication of slow progressive decrease in water yield, but it has not yet been determined whether this is significant. Evapotranspiration and other losses have apparently slightly increased; greater interception by improved vegetal cover is a factor in this increase. Peak discharges in both summer and winter floods have been markedly reduced to $\frac{1}{3}$ or $\frac{1}{4}$ of those before treatment. Reduction of surface run-off volumes was substantially the same in both winter and summer storms, showing the effect of coniferous cover. There has been no change in the recession of groundwater flow. The rate of sediment removal, a measure of erosion activity in the catchment, had decreased to 54% of the pre-treatment rate by 1946–7, to 23% in 1948–9, and to 10% in 1950. No detectable change that could be ascribed to the treatment was observed in the annual cycle of groundwater levels near the main stream.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 612 *et seq.*, 1071 *et seq.*

61. HODSON, A. C., and BROOKS, M. A. **The frass of certain defoliators of forest trees in the North Central United States and Canada.** *Canad. Ent.* 88 (2), 1956 (62–8). 20 refs. O.R.S.

A key has been compiled for the identification of larvae from the characteristics of the frass, using every known faecal character.

62. WATSON, W. Y. **A description of the immature stages of *Lithocolletis salicifoliella* Cham. (Lepidoptera: Gracillariidae).** *Canad. Ent.* 88 (4), 1956 (168–77). 7 refs. O.R.S.

63. MATHUR, R. N. **Immature stages of Indian Coleoptera (26)—Bostrychidae.** *Indian For. Rec. (n.s.) Ent.* 8 (10), 1954 (233–45). 5 refs.

64. BYTINSKI-SALZ, H. **The Cerambycidae of Israel.** *Bull. Res. Coun., Israel 5B* (3/4), 1956 (207–26). 24 refs. A.P.B.

A revised and annotated list of 84 species, including one new description and two new synonyms.

65. WOOD, S. L. **New species of bark beetles (Coleoptera: Scolytidae), mostly Mexican. Parts I & II.** *Canad. Ent.* 88 (4; 5), 1956 (141–54; 231–40). O.R.S.

66. BEAULNE, J.-I. Liste des Scolytidae du Québec. **[List of the Scolytidae of Quebec.]** *Rep. Quebec Soc. Prot. Pl. 1954*, 1956 (77–88). [F.]

With short notes on host trees etc.

67. LYON, R. L. **A secondary sex character on the male of the California five-spined engraver, *Ips confusus* (Lec.) (Coleoptera: Scolytidae).** *Canad. Ent.* 87 (11), 1955 (482–3). 4 refs. O.R.S.

The distinguishing character found in the present study is an enlarged tubercle on the frons, situated medially and just above the epistomal margin in the male, and easily distinguishable from a similarly placed and gently sloping cuticular embossment often found in females.

68. MCMULLEN, L. H., and WALTERS, J. **Transplanting larvae of *Dendroctonus pseudotsugae* Hopk. [to uninfested logs for experimental purposes].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (3–4).

Larvae in various stages of development were removed from their brood log and transferred to artificially-made niches in uninfested material. Survival was low in holes made with an increment borer, but 50–100% in holes made by removing a 3-sided chip by the use of a chisel.

69. CHAPMAN, J. A., and WILSON, J. W. **The use of impregnated paper as an approach to nutritional studies with the Douglas-Fir beetle.** *J. econ. Ent.* 49 (3), 1956 (426–7). 6 refs.

Results were not conclusive, but caged beetles appeared to prefer papers impregnated with starch, pectin or a sugar to untreated controls, and papers containing α-, β- and γ-cellulose + 0·1% lignin to papers of α-, or α- + β-cellulose alone. Only small amounts of paper were eaten, and feeding stopped after a few days. [Cf. *F.A.* 16 No. 3762.]

70. BRENY, R. L'embryon de *Neodiprion sertifer* Geoffr. en période hivernale. **[The embryo of *N. sertifer* during the winter period.]** *Bull. Inst. agron. Gembloux* 24 (2), 1956 (121–30). 5 refs. [F.] E.M.B.

71. GHENT, A. W. **Linear increment in width of the head capsules of two species of sawflies.** *Canad. Ent.* 88 (1), 1956 (17–23). 7 refs. O.R.S.

Presents data on *Neodiprion americanus banksianae* which indicate that growth in width of the head capsule can be represented almost exactly linearly. Published head-capsule measurements for *Fenusa pusilla* show that for this insect also the straight line gives a more accurate description of head-capsule growth than the exponential curve predicted by Dyar's rule.

72. BOUCEK, Z. **A contribution to the knowledge of the Chalcididae, Leucaspidae, Eucharitidae (Hymenoptera, Chalcidoidea) of the Near East.** *Bull. Res. Coun. Israel* 5*B* (3/4), 1956 (227–59). A.P.B.

An annotated list with references covering 50 species of the first, 50 of the second, and 8 of the third group (from Turkey, Cyprus, Syria, Iraq, Israel, Egypt, and Iran). There are 14 new descriptions.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 5, 603 *et seq.*, 1167.

73. QUICK, H. F. **Rodent populations on the University Forest [, Orono, Maine].** *Tech. Note Univ. Me. For. Dep.* No. 41, 1955. pp. 3.

Reports on a 6-year study of populations of small rodents. Results indicate that variations in population are basically independent of felling operations.

74. TEVIS, L., JR. **Responses of small mammal populations to logging of Douglas Fir.** *J. Mammal.* 37 (2), 1956 (189–96). 9 refs. O.R.S.

Trapping in some clear-felled areas in virgin Douglas Fir in N.W. California, mainly between May and November 1952, showed that 8 species increased and 4 decreased after clear felling. *Peromyscus maniculatus* and *Eutamias townsendii*, the species chiefly responsible for failure of artificial regeneration, increased most, reaching levels 2–4 times those in virgin forest, in the 3rd to 10th year after felling; for 3 months (*P. maniculatus*) and 1 year (*E. townsendii*) after felling, numbers remained roughly the same as in uncut forest.

75. TEVIS, L., JR. **Invasion of a logged area by golden-mantled squirrels.** *J. Mammal.* 37 (2), 1956 (291–2). O.R.S.

Logging in Douglas Fir and *Abies concolor* on mountain slopes in N.W. California was followed after about 4 years by the establishment and increase by breeding of *Citellus lateralis* subsp. *trinitatis*. Poisoned wheat bait failed to control their increase and they must now be considered a threat to regeneration in the area.

76. LAY, D. W. **Effects of prescribed burning on forage and mast production in southern Pine forests.** *J. For.* 54 (9), 1956 (582–4). 11 refs.

In experiments for controlling the hardwood understorey in Pine forests of East Texas, spring, summer and winter burnings were carried out thrice at 2- and 3-year intervals. After the 2nd fire the height of the understorey was reduced from 9·2–11·7 ft. to 1·8–5·8 ft. The only common species of deer food to suffer was *Ilex vomitoria*, whereas fire increased *Callicarpa americana*, *Viburnum molle* and herbs. The understorey mast production was, however, considerably diminished—plants of fruiting size being reduced by 62–72%, and plants bearing fruit by 68–78%.

16. General Botany

160. Plant Chemistry

See also Nos. 22–6, 30, 82, 88, 111–2, 126, 153, 192–4, 199, 546, 634, 921 *et seq.*, 1147 *et seq.*

77. KOLOBKOVA, E. V., and KUDRJAŠOVA, N. A. O tormozitele prorastanija iz semjan žëltoĭ akacii. **[A germination inhibitor from seeds of *Caragana arborescens*.]** *Fiziol. Rast.* 3 (2), 1956 (115–20). 27 refs. [Russ.russ.] A.P.B.

Aqueous extracts of *C. arborescens* seeds, especially those from unripe seeds, were found to have a strong inhibiting effect on the germination of *Phaseolus aureus*. Analysis of the active fraction by paper chromatography showed that a comparatively small number of amino-acids and asparagine were present. In tests using the pure form of the amino-acids found, tryptophan was the most active

inhibitor, and still caused evident inhibition at concentrations as low as 0·00001 *M*.

78. FERENCZY, L. **Antibacterial substances in seeds.** *Nature, Lond.* 178 (4534), 1956 (639–40). 6 refs.

While investigating the physiology of germination it was noted that micro-organisms on the seeds of certain species proliferated rapidly during germination, whereas seeds of other species under the same conditions remained sterile. Tests for the presence of antibacterial substances were carried out with seeds of many species, including *Fraxinus* spp. and some conifers. Whole seeds were tested, except for Ash, where the seeds were cut transversely. Seeds of 36 species yielded positive results. In most, the effect was selective, the diffusing compounds inhibiting the increase of only the Gram-positive bacteria. The inhibitor of the *Fraxinus* seeds proved effective also against most Gram-negative test micro-organisms. The diffusing compounds, except the inhibitor of the *Fraxinus* spp. were localized in the seed coat.

79. FERENCZY, L. **Occurrence of antibacterial compounds in seeds and fruits.** *Acta biol., Budapest* 6 (3/4), 1956 (317–23). 25 refs. [E.e.russ.g.] O.R.S.

Species inhibiting growth of Gram-positive micro-organisms included *Abies alba*, *Picea glauca*, *Picea abies* var. *chlorocarpa*, *Pinus nigra* and *P. strobus*, *Pseudotsuga taxifolia*, *Juniperus chinensis* and *J. virginiana*, and *Thuja occidentalis*. *Fraxinus excelsior* and *F. pennsylvanica* inhibited both Gram-positive and Gram-negative groups.

80. NILSSON, M. **Constituents of pollen. I. Low-molecular carbohydrates in pollen from *Pinus montana* Mill.** *Acta chem. scand.* 10 (3), 1956 (413–5). 14 refs. [E.e.] O.R.S.

81. NIELSEN, N. **The vitamin content of pollen after storing.** *Acta chem. scand.* 10 (2), 1956 (332–3). 1 ref. [E.] O.R.S.

[Cf. *F.A.* 17 No. 1198.] After 1 year, pollen of *Alnus incana* showed the greatest reduction in content of the 6 vitamins studied. In all species (*Zea mays*, *A. incana*, *A. glutinosa*, and *Pinus mugo*) panthothenic acid was the least stable of the 6 vitamins.

161. Physiology

See also Nos. 126–9, 183 *et seq.*, 267, 373, 674, 746, 867, 871–2, 1203.

82. **Colloquium on tree physiology at Plant Physiologists' Conference in Ottawa, October 31, 1955.** *For. Chron.* 32 (2), 1956 (167–71).

Summarizes the following papers: Seasonal patterns in the water contents of trees (*R. D. Gibbs*); A note on water conduction in trees (*K. N. H. Greenidge*); Recent researches on the physiology of Maple sap flow (*J. W. Marvin*); Ascent of sap in the dormant, and winter condition (*M. Cailloux*); The diffusion pressure deficit of water in roots (*D. A. Fraser*); Electro-osmosis as a possible contributing force in transport (*D. Fensom*); Translocation of minerals in trees (*D. A. Fraser*); Specific increments and their relation to the quantity and activity of growth in *Pinus resinosa* (*G. H. Duff* and *N. J. Nolan*); Experimental studies in polarity and regeneration in the Lombardy Poplar (*S. Shapiro*); Some principles involved in the mycorrhizal symbiosis in forest trees (*V. Slankis*); and Studies in the chemistry of the living bark of the Black Locust in relation to frost hardiness and the seasonal cycle (*D. Siminovitch, A. P. J. Chater*, and *I. Swann*).

83. **Annual review of plant physiology.** Annual Reviews Inc., Palo Alto, Calif. No. 7, 1956. pp. 456. Many refs.

Includes the following review articles, containing many references to forest species: Mineral nutrition of plants: mechanisms of uptake and transport (*E. Epstein*); Energy transformations in photosynthesis (*L. N. M. Duysens*); Nitrogen fixation by photosynthetic organisms (*G. E. Fogg*); Endogenous rhythms in plants (*E. Bünning*); The physiology of cell division (*H. Stern*); Obligate parasitism (*C. E. Yarwood*); Biological relations of plant viruses (*C. W. Bennett*); Iron chlorosis (*J. C. Brown*); Photoperiodism in woody plants (*P. F. Wareing*); Plant proteins (*C. E. Danielson*); Physiology of root elongation (*J. G. Torrey*); Mechanisms of carbohydrate breakdown in plants (*B. Axelrod* and *H. Beevers*); Physiology of seed germination (*E. H. Toole, S. B. Hendricks, H. A. Borthwick* and *V. K. Toole*); Phosphorus metabolism and photosynthesis (*D. I. Arnon*); Absorption and translocation of plant regulators (*J. van Overbeek*); Effects of light quality and plant growth (*E. C. Wassink* and *J. A. J. Stolwijk*); Recent advances in plant physiology in the U.S.S.R. (*A. L. Kursanov*).

84. ZENTGRAF, E., and BARNER, J. Die Aufnahme radioaktiven Phosphates durch die Wurzel der Tanne. **[The uptake of radioactive phosphate by Fir roots.]** *Allg. Forst- u. Jagdztg.* 126 (1), 1955 (23–4). [G.e.]

Describes experiments with phosphates containing P^{32} on *Abies alba* 40–50 cm. high. Uptake was much faster through shallow lateral roots than through taproots. Mycorrhizae accelerated uptake. Translocation into branches was strongly influenced by light conditions.

85. SATOO, T. **[The influence of wind on transpiration of some conifers.]** *Bull. Tokyo Univ. For.* No. 50, 1955 (27–35). 14 refs. [Jap.e.]

Using (*a*) *Cryptomeria japonica*, (*b*) *Chamaecyparis obtusa* and (*c*) *Pinus densiflora*, the initial acceleration after 20 min. exposure was highest in (*c*) and lowest in (*b*). Differences in transpiration rate became insignificant at about 150 min., when the rate was slower than in quiet air. Transpiration increased with wind velocity but not proportionally, as a deceleration occurred at 0·3–0·6 m./sec., clearly marked in (*c*) and (*b*), but slight in (*a*).

86. SANTAPAU, H. **Extensive loss of water by forest trees in the Dangs Forest.** *J. Bombay nat. Hist. Soc.* 53 (3), 1956 (501). O.R.S.

Water loss by *Ougeinia dalbergioides*, *Mangifera indica*, *Grevillea robusta*, *Syzygium cumini* and other species between sunrise and ca. 10 a.m. was so great that when the tree stood between the observer and

the sun, the falling moisture appeared as a constant drizzle. Relative humidity of the atmosphere at the time was ca. 80%, and temperature 80–82° F.

87. POLSTER, H. Vergleichende Untersuchungen über die Kohlendioxydassimilation und Atmung der Douglasie, Fichte und Weymouthskiefer. [**Comparative studies of CO_2 assimilation and respiration in Douglas Fir, Norway Spruce and Weymouth Pine.**] *Arch. Forstw.* 4 (7/8), 1955 (689–714). 30 refs. [G.g.]

A detailed study was carried out on the sun leaves of the lower crown of full-grown trees to ascertain the physiological causes of the differences in timber production of (*a*) *Pseudotsuga taxifolia*, (*b*) *Picea abies*, and (*c*) *Pinus strobus*. The apparatus included an infra-red absorption recorder [cf. *F.A.* 14 No. 65], so sensitive that half a scale unit showed an alteration of 0·00025% CO_2 volume, and radiation, thermohygrograph and light-intensity recorders. Laboratory investigations covered the assimilation and respiration of Douglas Fir needles of varying age. The daily course of these two processes in the field is shown in mg. CO_2/g. fresh needle weight (from gas analysis, the apparatus of which is described) against that of the climatic factors (light, temperature, humidity) in 13 record charts representing various weather conditions. Assimilation was greatest on cool dry days with varying cloud and nil on very sunny days. (*a*) assimilated most, then (*c*) then (*b*), the superiority of (*a*) increasing as assimilation conditions improved. In very weak light all three were similar. Maximum assimilation intensity was reached at 8000–16,000 lux ($\frac{1}{4}$–$\frac{1}{9}$ of the highest daylight intensity). Respiration (preponderatingly influenced by temperature) was similar in the (*a*) and (*c*) and considerably less in (*b*), but the greater assimilation of (*a*) makes it still the greatest producer of solid substance. In both summers (1953 and 1954) the months of the study were cold, and only 5–36% of the day's intake of CO_2 was respired by the 3 species, compared with up to 50% in other studies. In (*a*) young needles assimilated most and respired least. The greater needle mass and assimilation energy of (*a*) results in an organic-substance production about 100% more than that of (*b*) (using Burger's data), a superiority reflected in the stem-timber production of a 30-year stand but falling to 50% more at 50 years on account of the higher proportion of branchwood in (*a*).

88. ZIEGLER, H. Untersuchungen über die Leitung und Sekretion der Assimilate. [**The translocation and secretion of assimilates.**] *Planta* 47 (5), 1956 (447–500). Many refs. [G.g.] O.B.D.

The results of a study of the sieve-tube sap in *Alnus glutinosa*, *A. incana*, *Acer platanoides*, *Castanea sativa*, *Populus nigra*, *Quercus borealis*, *Q. robur*, *Q. sessiliflora*, *Fagus sylvatica*, *Tilia platyphyllos* and *Robinia pseudoacacia*, its chemical composition, its viscosity, the daily course of concentration of the constituents, its relationship to other kinds of sap in the plant and the physiology of the translocation and secretion of the assimilates.

89. TAKEUCHI, M. **Studies on the germination of the pollen grains in conifers. I.** *Japanese Journal of Botany, Tokyo* 14 (1), 1953 (13–21 + 5 plates). 16 refs. [E.e.] C.G.B.

Three types of pollen-tube development (illustrated by photomicrographs) were found among the 12 species examined. In group A (Taxaceae, Cephalotaxaceae, Sciadopityaceae, and Juniperaceae) the exine ruptures irregularly; in group B (Cryptomeriaceae) a 'bubble' of the transparent layer pushes its way through the exine; and in group C (Pinaceae, Abietaceae, and Podocarpaceae) the wings of the pollen separate and the exine between them splits. The pollen membrane consists of 4 layers, the exine, the 'thin membrane', the transparent layer (consisting of pectin that absorbs water, causing swelling), and the protoplasmic membrane, apparently covering the protoplasm. No protoplasmic movement was seen in the pollen tube.

163. Embryology

90. SACHER, J. A. **Observations on Pine embryos grown *in vitro*.** *Bot. Gaz.* 117 (3), 1956 (206–14). 18 refs. O.B.D.

Mature embryos of *Pinus lambertiana* were excised aseptically from seeds stratified at 5° C. for 6 weeks, and were grown in light on the surface of a medium containing inorganic nutrients, 2% sucrose, and 0·8% agar. Normal healthy seedlings resulted. After 3 weeks in culture, root elongation ceased, and growth of the shoot consisted in slow but normal growth of the terminal bud. The causes of cessation of root elongation were not determined. Histological studies showed abnormalities in the roots as evidenced by maturation of xylary elements within 150μ of the apex. That meristematic potentialities resided in the seemingly senescent roots was manifested by the profuse formation of short roots when naphthalene-acetic acid was added to the medium. Where roots failed to develop, the hypocotyl and epicotyl grew in a vigorous and normal fashion. Histological studies of the base of the hypocotyl disclosed that the root apex had become dichotomous, followed by arrested growth in the branches and maturation of vascular tissue to within 50μ of the apical initials. Adventitious roots were not formed under any of the cultural conditions. *From author's summary.*

91. NAIR, N. C. **Early endosperm development in Meliaceae.** *Sci. & Cult.* 22 (1), 1956 (34–5). 6 refs. E.M.B.

Observations on the fertilization and early endosperm development of *Melia azedarach*, *Azadirachta indica*, *Naregamia alata* and *Cedrela toona* tend to refute the suggestion of autonomous endosperm formation.

164. Morphology

See also Nos. 142, 151, 153, 157, 160.

92. CAMEFORT, H. Étude de la structure du point végétatif et des variations phyllotaxiques chez quelques Gymnospermes. [**The structure of the growing point and variations in phyllotaxy in some Gymnosperms.**] *Ann. Sci. nat. (Bot.)* 17, 1956 (1–185 + 9 plates). 239 refs. [F.] O.B.D.

93. HARDIN, J. W. **Studies in the Hippocastanaceae. II. Inflorescence structure and distribution of**

perfect flowers. *Amer. J. Bot.* 43 (6), 1956 (418–24). 9 refs. [Cf. *F.A.* 16 No. 3802.] O.B.D.

94. HARRIS, W. F. **Pollens of *Nothofagus*. Variations in size and number of apertures from flower to flower on the same tree [of *N. solandri*].** *N.Z. J. Sci. Tech.* 37*B* (6), 1956 (635–8). 1 ref. P.R.

95. HARRIS, W. F. **Pollen characters in *Nothofagus*.** *N.Z. J. Sci. Tech.* 37*B* (6), 1956 (731–65). 18 refs. P.R.

96. SAUER, E. Stachelähnliche Bildungen bei einem Bastard zwischen zwei Balsampappeln. **[Thorn-like formations on a hybrid Balsam Poplar.]** *Z. Forstgenet.* 5 (4), 1956 (103–4). [G.e.f.]

Describes thorn-like outgrowths on the corky ridges of the internodes on one seedling derived from the artificial cross *Populus candicans* × *P. trichocarpa*.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 161–3, 222–3, 231, 233, 235, 327–33, 335–9, 439, 858, 867, 877, 903, 1203.

97. VABRE-DURRIEU, A. Structure nucléaire quiescente chez quelques Abiétacées. **[The structure of resting nuclei in some Abietineae.]** *C.R. Acad. Sci., Paris* 242 (14), 1956 (1811–3). [F.f.] O.R.S.

A study of the fine structure of the nucleus of a number of species confirms the hypothetical arrangement of *Abies-Cedrus*, *Larix-Pseudotsuga*, *Pseudolarix-Keteleeria*, *Picea* and *Tsuga* as separate phyletic groups and the grouping of Pines into the subgenera *Haplopinus* and *Diplopinus*. A more complete study is needed.

98. LARSEN, C. S. [Translated by ANDERSON, M. L.] **Genetics in silviculture.** Oliver and Boyd, Edinburgh. 1956. pp. 224. Many refs. [E.] Price 30*s*.

A new textbook, including sections on progeny trials, controlled pollination, vegetative propagation, seed orchards, tree-shows (groups of plants produced vegetatively, each group representing a single clone, laid out in such a way as to allow comparisons), breeding and diseases, hybrids, genetics, breeding of Larch, and breeding and mechanization. Examples and results are drawn from breeding stations throughout the world.

99. MITCHELL, H. L. **Breeding for high-quality wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2050 1956. pp. 9 + 2 dgms., 2 gphs. 6 refs. P.R.

Stresses the importance of intrinsic wood quality (the basic anatomical features that determine the suitability of wood for a given purpose) to the forest genetics programme, and the significance of genetical research for wood-using industries.

100. DELLINGSHAUSEN, M. v. *et al.* Forstgenetik und Forstpflanzenzüchtung in Schmalenbeck. **[Forest genetics and tree breeding at Schmalenbeck.]** *Z. Weltforstwirt.* 18 (5/6), 1955 (203–7). [G.]

An account of work and methods used at the Institut für Forstgenetik und Forstpflanzenzüchtung [cf. *F. A.* 13 No. 2773].

101. HELLINGA, G. **On forest tree improvement in Indonesia.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/101, 1956. pp. 3.

102. LIBBY, W. J., BARNES, B. V., and SPURR, S. H. **Forest genetics in the Lake States: an annotated bibliography.** School of Natural Resources, University of Michigan, Ann Arbor, Mich. 1956. pp. 74.

Arranged alphabetically under authors, and indexed under the Oxford Decimal Classification.

103. **Laying the foundation for forest tree improvement in the Lake States.** Wisconsin-Michigan Section of the Society of American Foresters, Lansing, Mich. 1956. pp. 32.

Proceedings of a technical session of the section, held in Feb. 1956. The following papers are included: Laying the foundation for forest tree improvement (*P. O. Rudolf*); Laying the foundation for improving the Pines in the Lake States (*R. G. Hitt*); Laying the foundation for improving the Spruce in the Lake States (*H. Nienstaedt*); and Laying the foundation for improving the Aspen and Cottonwoods in the Lake States (*P. N. Joranson*).

104. **Proceedings of the third Southern Conference on forest tree improvement.** Southern Forest Experiment Station, New Orleans, La. 1955. pp. iii + 132. Many refs.

Progress reports on the Southern Pine study, including the occurrence of pests (*W. H. Berch* and *J. F. Coyne*); the Crossett 'seed-source study in reverse'; the TVA and the Bogalusa Loblolly Pine seed-source studies; the TVA superseedling study; Loblolly drought-tolerance and Slash Pine turpentine-yield studies; seed orchards in the South; Westvaco Seed production area; the activities and programmes of the Forest Genetics Research Foundation, the federal Research Stations and many other Institutes and bodies; with some general papers e.g. on possibilities and limitations of hybridization in *Pinus* (*F. I. Righter*) and Southern Pine hybrids, natural and artificial (*A. G. Johnson*); also one paper on possibilities of genetics research in Southern hardwoods (*J. A. Putnam*).

105. SATO, Y., and MUTO, K. **On the viability of forest tree pollen.** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (967–79). 12 refs. [E.e.jap.]

For pollen of (*a*) *Alnus tinctoria*, (*b*) *Betula japonica*, (*c*) *B. maximowicziana* and (*d*) *B. ermani*, the optimum germination conditions were 15% sucrose solution for all except (*d*), which required 10%; 20° C. for all species; a pH of 5·7 for (*a*) and (*c*), more acid media for (*b*) and (*d*). For prolonging longevity, a temperature of − 8° proved best for all; storage in evacuated containers prolonged viability. Stored in sealed bottles, the pollen of (*c*) mixed with 10 g. of Adsol and 2 g. of K_2S, and of (*a*), (*b*) and (*d*) mixed with 20 g. of Adsol and 2 g. of K_2S were successfully stored for 600 days. The use of K_2S alone was harmful to all species studied. Stored in evacuated containers at 3–5° (fruit-storage temperature) all pollens have been successfully stored for > 600 days.

106. MAURINJ, A. M., and KAUROV, I. A. Sravnenie metodov opredelenija žiznesposobnosti pylcy drevesnyh porod. **[Comparison of methods of determining the viability of tree pollen.]** *Bot. Ž.* 41 (1), 1956 (81–4). 7 refs. [Russ.]

Parallel tests were made of two methods: (*a*) germination *in vitro*, using sucrose solutions of various concentrations, with or without agar, as the medium; and (*b*) Šardakov's staining method based on a peroxidase reaction, developed for pollen of cotton [*Dokl. Akad. Nauk S.S.S.R.* 26 (3), 1940]. Results are tabulated and statistically analysed, taking for (*a*) the figures given by the optimum medium, for pollen of 33 woody species, including *Larix kurilensis*, *Pinus sylvestris*, *Pseudotsuga taxifolia*, *Acer* spp., *Alnus* spp., *Betula* spp., *Phellodendron* spp. and *Tilia* spp. Method (*b*) gave more accurate results and is much simpler than (*a*).

107. GIORDANO, E., and BONECHI, R. Prove di germinazione e prove colorimetriche nella determinazione della vitalità del polline di pini mediterranei. **[Germination tests and colorimetric methods for determining the viability of pollen of Mediterranean Pines.]** *Ital. for. mont.* 11 (4), 1956 (175–81). 10 refs. [It.f.]

Experiments were conducted on pollen of *Pinus halepensis*, *P. pinaster* and *P. pinea*. Germination tests in distilled water gave the best results, highest values being generally obtained after 72 hours for fresh pollen and after 96 hours for stored. Of the chemical methods, that using tetrazolium salts gave better results than Na biselenite, but neither is likely to be much used, since germination tests give more accurate results in the space of a few days.

108. REINES, M., and GREEN, J. T., JR. **A syringe for Pine pollination.** *J. For.* 54 (9), 1956 (598). 1 ref.

Describes, with illustration, adaptation of a 30-c.c. polyethylene syringe (10 cm. × 22 mm. diam.) as used by veterinary surgeons. In place of the plunger, a ½-oz. B-D rubber bulb or 1-oz. Davol ear syringe is attached. A rubber stopper (No. 4) acts as adapter between the rubber bulb and syringe barrel. At the end is a No. 15 Stub's gauge syringe needle 1½ in. long. A suggested supplier is Goshen Laboratories, Inc., Goshen, N.Y.

109. MAGINI, E. Expériences de génétique sur les pins méditérranéens. (Note préliminaire.) **[Genetical experiments with Mediterranean Pines. (A preliminary note).]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/107, 1956. pp. 6. [F.]

Short notes on the programme being carried out at Florence on *Pinus halepensis*, *P. pinaster* and *P. pinea*, covering: (1) interspecific hybridization, (2) hybridization of races of *P. pinaster*, (3) controlled crosses between trees of *P. pinea*, (4) selfing of individuals of the 3 species. Includes notes on techniques of pollen storage, grafting etc.

110. BINGHAM, R. T., SQUILLACE, A. E., and PATTON, R. F. **Vigour, disease resistance, and field performance in juvenile progenies of the hybrid *Pinus monticola* Dougl. × *Pinus strobus* L.** *Z. Forstgenet.* 5 (4), 1956 (104–12). Many refs. [E.e.g.f.]

The performance is reported and discussed of 16 different hybrid progenies from controlled pollinations between blister-rust-resistant selections of *P. monticola* and *P. strobus*. These are compared with their parents, with grafts from the parent trees, and with progenies from intraspecific crosses involving either the *P. monticola* or the *P. strobus* parent. The material studied was at or near Spokane, Washington, and at Wisconsin Rapids, Wis. At Spokane, but not in Wisconsin, the hybrids showed definite hybrid vigour for the first 2 years. Hybrid seed germinated more rapidly and more completely than seed from *P. monticola* intraspecific crosses. Height growth among the young hybrid progenies varied greatly at both sites. Mean height growth in hybrid progenies was significantly correlated with that of progeny from intraspecific crosses of individual parents and with that of grafts from the parents; selection for rapid height growth should therefore be exercised among proposed parents of hybrids. Preliminary investigations of rust resistance among 8 young hybrid progenies indicated that the resistance of the hybrids may be lower than in the progeny of corresponding intraspecific crosses. Among 4 *P. monticola* parents tested, however, one with proved ability to transmit resistance to its intraspecific progeny also transmitted the resistance to a hybrid. Preliminary observations indicated that the hybrids are intermediate between the two parents in their ability to remain erect and withstand mechanical injuries from snow in the northern Rocky Mountains, and in their susceptibility to winter injury to foliage and young shoots in central Wisconsin. [Cf. *F.A.* 14 No. 3053.]

111. CALLAHAM, R. Z. **Needle oils of three Pine species and species hybrids.** *For. Sci.* 2 (2), 1955 (101–5). 7 refs.

An examination of the physical properties of the needle oils of (*a*) *Pinus ponderosa*, (*b*) *P. jeffreyi*, (*c*) *P. coulteri*, hybrids ($b \times a$) and ($b \times c$), and a backcross ($b \times (b \times c)$), showed no striking interspecific differences. Immunity to the needle-eating Pine reproduction weevil (*Cylindrocopturus eatoni*) has been demonstrated in (*c*) and in ($b \times c$) [cf. *F.A.* 12 No. 961] but it is evident that this host selection cannot be associated with the physical properties of the leaf oils. The oleoresin turpentines are a more useful subject for Pine hybridization studies. [Cf. *F.A.* 13 No. 3619; 17 No. 3645.]

112. MIROV, N. T. **Composition of turpentine of Lodgepole × Jack Pine hybrids.** *Canad. J. Bot.* 34 (4), 1956 (443–57). 28 refs. O.R.S.

The F_1 generation of artificial crosses produced turpentine in which the 'bi-cyclic' terpenes of Jack Pine dominated over the simpler, monocyclic terpene-phellandrene of Lodgepole Pine. Trees in a natural hybrid swarm also tended towards a predominance of the Jack Pine bi-cyclic terpenes. *From author's summary.*

113. HESMER, H., and FELDMANN, A. Die natürliche Verbreitung und der frühe Anbau der

Kiefer im Ostmünsterland. Zur Geschichte einer übersehenen erhaltenswerten Kiefernprovenienz. [**The natural range and early cultivation of *Pinus sylvestris* in East Münster. The history of a Pine provenance hitherto neglected, but worth preserving.**] *Forstarchiv* 25 (10), 1954 (225–37). 61 refs. [G.]

Use of native seed, and very ready natural regeneration, have contributed to the preservation of this native Pine provenance in E. Münster. The present mature stands show trees of symmetrical habit with a straight stem and a pointed crown of medium breadth. This provenance is presumably adapted to the Atlantic type of climate.

114. GOTHE, H. Ein Kreuzungsversuch mit *Larix europea* D.C., Herkunft Schlitz, und *Larix leptolepis* Gord. 3. Mitteilung. [**Trials in crossing *L. decidua* (Schlitz provenance) and *L. leptolepis*. Third report.**] *Z. Forstgenet.* 5 (4), 1956 (116–25). Many refs. [G.g.e.f.]

[Cf. *F.A.* 15 No. 1106.] A report on the third and fourth years' growth. The superior height growth of the hybrids was maintained in both years. In the fourth year, during which the climate was atlantic, *L. leptolepis* made such good growth and *L. decidua* so much less in comparison, that in the course of the year their height-growth curves crossed. It is possible that these reactions to climatic influences are caused by inheritable characteristics of the two species. In diameter growth the hybrids were superior to the parents. Inherited differences in time of flushing were clearly shown in the different progenies. Some preliminary data on variations in growth habit are also presented. The study reveals the value of measurements made frequently and over short periods during the growing season of each plant. *From author's summary.*

115. ILLIES, Z. M. Veränderungen der Pollengrösse bei Lärche nach Blütenbehandlung mit Colchicin. [**Changes in the size of Larch pollen after treatment of the flowers with colchicine.**] *Z. Forstgenet.* 5 (4), 1956 (112–5). 16 refs. [G.g.e.f.]

In order to obtain unreduced diploid germ cells, flowers from grafts of a *Larix leptolepis* plus-tree were treated during meiosis with a warm solution of 0·2% colchicine in a partial vacuum during the diakinesis interphase. Investigations of the pollen grains at mitosis showed both haploid and diploid chromosome numbers. Later, comparative measurements of pollen diameter were made from treated and untreated flowers. Pollen diameters of the untreated flowers followed a single-peaked binomial curve between 15 and 28 units of diameter, while those of the colchicine-treated flowers showed a double-peaked curve and a variation in diameter of between 12 and 34 units. [Cf. *F.A.* 17 No. 1247.] *From author's summary.*

116. GALOUX, A. Considérations phytogéographiques et variabilité génétique du Douglas (*Pseudotsuga taxifolia*). [**Plant-geographical considerations and the genetic variability of *P. taxifolia*.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/103, 1956. pp. 9. [F.]

Illustrates the way in which studies in plant geography and plant sociology can throw light on problems relative to the genetical structure of species, by a discussion of the palaeobotany, distribution, ecology etc. of *P. taxifolia*, which, on this evidence, the author is inclined to divide into two species—*P. taxifolia* and *P. glauca.*

117. SCHOLZ, E. Röntgenmutationen bei der Birke. [**X-ray-induced mutations in Birch.**] *Abstr.* in *Z. Forstgenet.* 5 (4), 1956 (126–7). [G.]

Describes mutations induced in *Betula verrucosa* and *B. pubescens* by X-ray treatment of seeds.

118. EIFLER, I. Artkreuzungen bei Birken. [**Species crosses in Birch.**] *Abstr.* in *Z. Forstgenet.* 5 (4), 1956 (128–9). [G.]

A preliminary report on successful crosses at the Waldsieversdorf tree-breeding station between (1) *Betula verrucosa* and *B. pubescens* and (2) *B. verrucosa* and *B. pubescens* var. *urticifolia.*

119. CORNUZ, L. Un cas intéressant d'hybridité du chêne vert. [**An interesting case of hybridization in *Quercus ilex*.**] *Schweiz. Beitr. Dendrol.* No. 6, 1955 (1956), (23–5). [F.]

Describes some seedlings, apparently natural hybrids of *Q. ilex* and *Q. robur*. The leaves are intermediate in form, size, toothing, persistence and hairiness.

120. GARAVEL, L. À la recherche de noyers résistants au froid. [**The search for frost-resistant Walnuts.**] *Rev. for. franç.* 8 (8/9), 1956 (572–5). 4 refs. [F.]

Discusses the reaction of *Juglans regia* to low temperatures. Whereas the ripened wood is resistant to frost, young shoots are very susceptible to frost damage, and the species therefore suffers from both early and late frosts. Mountain races, which have a very short growing season at high altitudes and are therefore safe from this danger, tend to shoot very early when planted at low altitudes and so are liable to damage from late frosts. Strains from low altitudes, when planted in the mountains retain their original vegetative rhythm and tend to suffer from both early and late frosts. The answer to the problem seems to be always to use local strains.

121. MOFFETT, A. A. **Genetical studies in Acacias. 1. The estimation of natural crossing in Black Wattle.** *Repr.* from *Heredity* 10 (1), 1956 (57–67).

(1) In 26 trees of *A. mollissima* studied, the % seed set on self-pollination was consistently lower than that from open-pollination. (2) The progeny of 21 of the trees segregated for recessive characters in both selfed and open-pollinated families. From the divergence from expectation of the ratios of dominant to recessives in open-pollinated families, the approximate degree of natural crossing was calculated. (3) Cross-pollination ranged from 62 to 97% with a mean of 84% and in this respect Black Wattle was very similar to Green Wattle. (4) Linkage between 2 characters, pointed pinnules and dwarf habit, was found in 4 families, the recombination value being approximately 8·7%. *From author's summary.*

122. GIORDANO, E. Il miglioramento genetico degli eucalitti in Italia. **[Breeding Eucalypts in Italy.]** *Cellulosa e Carta* 7 (7), 1956 (8–12). 23 refs. [It.]

A review of progress (in Europe generally) to the present time and forecast of future developments in Italy.

123. LĂZĂRESCU, C. **Contribution to the method of obtaining and breeding Ash-tree hybrids.** *Rev. Biol., Bucarest* 1 (1), 1956 (117–26). 8 refs. [E.] C.G.B.

Experiments in breeding Ash hybrids at the Snagov Experimental Station are directed towards the development of types suited to (*a*) steppe, (*b*) floodland conditions. American species (*Fraxinus pennsylvanica* and *F. pennsylvanica* var. *lanceolata*) were pollinated from native *F. excelsior*, and the resultant seedlings treated by Michurin's 'mentor' system, i.e. grafted on to *F. excelsior* seedlings or had *F. excelsior* grafted on to them. The American flower at the same time as the native species, and hybridization was perfectly successful. Fruit obtained by cross-pollination generally resembled that of the ♀ parent in shape, but was smaller. In respect of germination, the seed behaved like the ♀ parent and germinated in the first year, not, like *F. excelsior*, in the second year. Young F_1 seedlings exhibited some degree of heterosis and resembled the ♀ parent morphologically, but in the second year began to display some intermediate features in colour etc.

166. Economic Botany (General)

124. WILLIAMSON, J. **Useful plants of Nyasaland.** Government Printer, Zomba. 1956. pp. 168. 31 refs. Price 15*s*.

A descriptive list of indigenous and exotic plants arranged under scientific names (525, including 42 unidentified), with vernacular and English indexes and classification under edible, medicinal, wood, fibres, and miscellaneous. The 100 species whose wood is used include 9 important timber species.

168. Histology

See also Nos. 854 *et seq.*

125. HUBER, B. [Editor]. Vergleichend-anatomische Untersuchungen aus dem forstbotanischen Institut München. **[Studies in comparative anatomy at the Institute of Forest Botany, Munich.]** Gustav Fischer Verlag, Jena. 1955. pp. 164 + 27 plates. [G.g.] Price *DM*.15·50.

Contains the following papers: (1) Comparative studies of transfusion tissue in some recent gymnosperms (*B. Lederer*; pp. 1–42 + 7 plates; 62 refs.), describing and illustrating this leaf tissue for 12 species, and distinguishing separate types for the Pinacaeae, *Taxus*, *Welwitschia* and the Cycadaceae. (2) Anatomical studies on the structure of [primary and secondary] lenticels and their periodical changes (*A. Wuntz*; pp. 43–72 + 11 plates; 31 refs.), distinguishing separate types for the gymnosperms, *Salix*, *Prunus* and *Sambucus*. (3) Studies on the ontogeny of medullary rays (*H. J. Braun*; pp. 73–131 + 1 plate; 33 refs.), dealing with *Pinus sylvestris*, *Quercus robur*, *Fagus sylvatica*, *Lonicera tatarica* and *Populus alba*. (4) The abnormal radial growth of *Carpinus betulus* and the role of the false rays (*W. Holdheide*; pp. 132–64 + 8 plates; 15 refs.) suggesting local deficiency of growth regulator as the cause.

126. **Growth studies: illumination and lignification.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (10–1).

Although it appears from previous experiments that the substance responsible for initiating lignification is of a fugitive nature and is not stored (or does not remain effective) over the winter, some evidence has recently been obtained that this substance may be accumulated during the growing season so that towards the end of the summer a sufficient reserve is available to permit lignification to proceed even if the leaves are then kept in darkness. This does not occur if the leaves have been starved of light during the greater part of the season, and in this case subsequent full illumination fails to induce proper lignification of the late summerwood fibres.

127. GAUTHERT, R. Sur les phénomènes d'histogénèse dans les cultures de tissus de *Pinus strobus* L. **[Phenomena of histogenesis in tissue cultures of *P. strobus*.]** *C.R. Acad. Sci., Paris* 242 (26), 1956 (3108–10). [F.f.] O.R.S.

128. BARNOUD, F. Sur la culture du tissu cambial des *Carpinus betulus* L., *Populus tremula* L., et *Quercus sessiliflora* Sm. **[The culture of cambial tissue of *C. betulus, P. tremula* and *Q. sessiliflora*.]** *C.R. Acad. Sci., Paris* 242 (11), 1956 (1508–9). 2 refs. [F.f.] O.R.S.

Cultures of all three have been maintained successfully for about 2 years. The addition of coconut milk stimulated the growth of *C. betulus* cultures but had little effect on cultures of Aspen and none on those of Oak.

129. JACQUIOT, C. Sur les besoins en auxine et les caractères morphologiques externes des cultures de tissu cambial de quelques espèces d'arbres. **[The growth-regulator requirements and external morphological characteristics of cultures of cambial tissue of some trees.]** *C.R. Acad. Sci., Paris* 243 (5), 1956 (510–2). 2 refs. [F.] O.R.S.

Includes details of the requirements of *Castanea sativa*, *Ulmus campestris*, *Betula verrucosa*, *Tilia parvifolia* and *Populus tremula*.

17. Systematic Botany

130. LITTLE, E. L., JR. **Stabilization of botanical nomenclature by conservation of specific epithets.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/105, 1956. pp. 4.

[Cf. *F.A.* 17 No. 3661.] Proposes that widely used names which, under a strict application of the international botanical code, should be replaced by less known names, could be retained according to their merits and degree of acceptance, either as *nomina specifica conservanda* by extending Art. 24 on conservation of names to species, or by rejection of the less known names as *nomina specifica rejicienda* under an addition to Sect. 13 on rejected names.

172.3. Bacteria

See Nos. 570–1, 590.

172.8. Eumycetes (True Fungi)

See also Nos. 571 *et seq.*, 1056 *et seq.*

131. HUNT, J. **Taxonomy of the genus *Ceratocystis*.** *Lloydia* 19 (1), 1956 (1–58). 81 refs. P.R.
With a key and descriptions of 50 species.

132. MACRAE, R. **Cultural and infertility studies in *Aporpium caryae*.** *Repr.* from *Mycologia* 47 (6), 1955 (812–20). 2 refs.
Includes a list of 15 collections of this species, available in the Ottawa Mycological Herbarium, a description of its sporophore and of two cultures. A key pattern is given.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

133. SOKOLOV, S. JA., and ŠIŠKIN, B. K. [Editors]. Derevjja i kustarniki SSSR, dikorastuščie, kuljtiviruemye i perspektivnye dlja introdukcii. **[Trees and shrubs of the U.S.S.R.—native, cultivated or promising for introduction.]** Akademija Nauk SSSR, Moskva. Vols. I, 1949, pp. 460; II, 1951, pp. 610; III, 1954, pp. 871. Many refs. [Russ.]
A dendrological manual, arranged systematically, describing the trees and shrubs wild, cultivated or possibly cultivable in the U.S.S.R., with keys and numerous illustrations and distribution maps. Each volume has its own bibliography and indexes of Russian and scientific names, and a table of seed weights where known. Vol. I covers the gymnosperms and includes also a key for their identification by wood structure, tables of the chief insect pests and diseases of the commoner species, and lists of species classified by stature and by suitability for particular regions of the U.S.S.R. Vol. II covers the monocotyledons, and Vol. III the dicotyledons from Trochodendraceae to Rosaceae.

134. **A.E.T.F.A.T.—index 1955. Index of the papers on systematic phanerogamy and of the new taxa concerning Africa south of the Sahara and Madagascar.** Association pour l'Étude taxonomique de la Flore de l'Afrique tropicale, Bruxelles. 1956. pp. 64. [F.E.] [Cf. *F.A.* 16 No. 3823.]

135. KEAY, R. W. J. **New taxa and combinations for the 'Flora of West Tropical Africa'. I. (Linaceae, Euphorbiaceae, Icacinaceae, Santalaceae, Rutaceae, Meliaceae). II. (Sapindaceae, Anacardiaceae).** *Bull. Jard. bot. Brux.* 26 (2), 1956 (183–209). O.B.D.
Includes descriptions of *Turraea leonensis*, *T. pellegriniana*, *Placodiscus riparius*, *P. splendidus*, *Eriocoelum oblongum*, *Trichoscypha baldwinii*, and *Sorinda collina*, spp. nov.

136. TISSERANT, C., and SILLANS, R. Matériaux pour la flore de l'Oubangi-Chari. **[Contributions to the flora of Ubangi-Shari [Capparidaceae, Rosaceae].]** *Notul. syst., Paris* 15 (2), 1956 (197–212). [F.] O.B.D.

137. ROBYNS, W. Flore des spermatophytes du Parc National Albert. III. Monocotylées. **[The spermatophyte flora of the Parc National Albert [Belgian Congo]: Vol. II. Monocotyledons.]** Institut des Parcs nationaux du Congo Belge, Brussels. 1955. pp. 571 + 1 map, 77 plates. [F.] Price [£6]. [Cf. *F.A.* 9 No. 2097.]

138. TURRILL, W. B., and MILNE-REDHEAD, E. [Editors]. **Flora of tropical East Africa: Canellaceae.** Crown Agents for the Colonies, London. 1956. pp. 4. Price 1*s.*
[Cf. *F.A.* 17 No. 3666.] Includes three species of *Warburgia.*

139. ROULEAU, E. **A check-list of the vascular plants of the province of Newfoundland.** *Contr. Inst. Bot. Univ. Montréal* No. 69, 1956 (41–106). [E.]

140. CUATRECASAS, J. **Studies in South American plants—IV.** *Brittonia, N.Y.* 8 (3), 1956 (195–200).
Includes descriptions of the new tree species *Vantanea magdalenensis*, *Hirtella adenophora*, *Couepia trapezioana*, *C. laurifolia* and *Licania hyalea.*

141. Árboles forestales argentinos. **[Argentine forest species.]** Dirección de Investigaciones Forestales, Administración Nacional de Bosques, Ministerio de Agricultura y Ganadería, Buenos Aires. [*n.d.*] pp. [54]. [Span.]
A loose-leaf folder containing coloured illustrations with brief notes on morphology, range in Argentina, wood characters and uses of 24 important Argentine trees. A map of vegetation types with short descriptions, and a glossary of terms are included.

174.2/.7. Gymnosperms

See Nos. 97, 116, 855–7, 929.

175.2. Monocotyledons

142. HOLTTUM, R. E. **The classification of Bamboos.** *Phytomorphology* 6 (1), 1956 (73–90). 24 refs. O.B.D.
A comparative study of the structure of the ovary, the fruit and the spikelet suggests that the classification used hitherto, based on fruit structure, is inadequate. A possible scheme of classification is suggested, based primarily on ovary structure.

176.1. Dicotyledons

See also Nos. 858–9, 1217.

143. PICHON, M. Monographie des Landol. phiées (Classification des Apocynacées, XXXV) **[Monograph of the Landolphiinae.]** *Mém. Inst. franç. Afr. noire* No. 35, 1953. pp. 437. 169 refs. [F.]
Admits for this sub-tribe, once (and in the recent war) an important source of rubber, 11 genera, with detailed discussion of morphology and phylogeny. Includes keys for identification and indexes to systematic and vernacular names and collection numbers.

144. GOMES, J. C., JR. Contribuição à sistemática das Bignoniaceae brasileiras. **[Taxonomy of the Brazilian Bignoniaceae.]** *Arq. Serv. flor., Brasil* 9, 1955 (261–96 + 3 plates). 44 refs. [Port.]

145. CUATRECASAS, J. **Studies on Andean Compositae. III.** *Brittonia, N.Y.* 8 (3), 1956 (179–93).
Species of *Diplostephium, Baccharis, Espeletia, Oliganthes, Jungia, Senecio* and *Werneria* from Colombia and Peru.

146. CUATRECASAS, J. Nouvelles espèces de l'Amérique du Sud récoltées par le Professeur Henri Humbert. (1re note). **[New species collected in S. America by H. Humbert (Note 1).]** *Notul. syst., Paris* 15 (2), 1956 (233–40). [F.] O.B.D.
Includes a description of *Espeletia humbertii*, a new tree species from Venezuela.

147. WHITE, F. **Notes on the Ebenaceae. I. The genus *Maba* in Africa.** *Bull. Jard. bot. Brux.* 26 (2), 1956 (237–46). 12 refs. O.B.D.
All of the African *Maba* species (except 7 for which no types were available) have been examined and are transferred to *Diospyros*. Synonyms are listed and the necessary new names or combinations are proposed. [Cf. *F.A.* 17 No. 1318.]

148. LÉONARD, J. **Notulae systematicae XVIII. Euphorbiaceae africanae novae.** *Bull. Jard. bot. Brux.* 25 (4), 1955 (281–301). [F.] O.B.D.
Describes a new tree species, *Cleistanthus michelsonii*, and a new subspecies, *Crotonogyne manniana* subsp. *congolensis*.

149. LÉONARD, J. À propos des genres africains *Grossera* Pax et *Cavacoa* J. Léonard (Euphorbiaceae). **[The African genera *Grossera* and *Cavacoa*.]** *Bull. Jard. bot. Brux.* 25 (4), 1955 (315–24 + 1 plate). [F.] O.B.D.
Describes a new tree species, *Grossera multinervis*, and some new combinations in the genus *Cavacoa*.

150. MARTÍNEZ, M. Los encinos de México. VI. **[The Oaks of Mexico. VI.]** *An. Inst. Biol. Univ. Méx.* 26 (2), 1955 (245–81). [Span.] C.G.B.
[Cf. *F.A.* 17 No. 1280.]

151. VENKATESH, C. S. **The taxonomic value of the androecium in the genus *Cassia*.** *J. Bombay nat. Hist. Soc.* 53 (3), 1956 (496–9). 1 ref. O.R.S.
Presents a key to the genus based on characters of the androecium.

152. RUDD, V. E. **The American species of *Aeschynomene*.** *Contr. U.S. nat. Herb.* 32 (1), 1955. pp. 172. O.B.D.

153. FIDALGO, M. E. P. KAUFFMANN. Contribuição ao estudo de *Lonchocarpus discolor* Huber 1901. **[Study of *L. discolor*.]** *Arq. Serv. flor., Brasil* 9, 1955 (179–259). 59 refs. [Port.]
A study of the systematics of the genus and the species, the anatomy of *L. discolor*, and the chemistry of the seeds and seed oil. The species appears to have promise as a producer of oil rich in vitamin D and as a shade tree for coffee.

154. BRUCE, E. A. **Notes on some Tropical African species of *Mostuea* Didr.** *Kew Bull.* 1956 (1), (159–60).
M. grandiflora and *M. ulugurensis* are reduced to synonymy under *M. walleri*, and *M. syringaeflora* and *M. amabilis* to synonymy under *M. microphylla*.

155. BRUCE, E. A. **Notes on African *Strychnos*: IV.** *Kew Bull.* 1956 (1), (153–8).
Taxonomic notes on sections *Syringiflorae, Heterophylla, Micranthae* ser. *Malacocladae*, and the species *S. xylophylla*.

156. FUKAREK, P. Dodatak članku 'Poljski jasen (*Fraxinus angustifolia* Vahl)'. **[Supplement to the article '*F. angustifolia*'.]** *Šum. List* 79 (1/2), 1955 (16–21). [Croat.e.]
[Cf. *F.A.* 16 No. 1498.] Gives additional important characteristics (illustrated) that can be used to distinguish *F. angustifolia* from *F. excelsior*.

157. COOPER, R. C. **The Australian and New Zealand species of *Pittosporum*.** *Ann. Mo. bot. Gdn.* 43 (2), 1956 (87–188). O.B.D.
A history of the genus, uses (mainly pharmaceutical) of various species, morphology, range, climatic requirements, prehistory and anatomy.

158. BREMEKAMP, C. E. B. Rubiacées nouvelles du Congo Belge et du Ruanda-Urundi (*Tricalysia, Trichostachys, Pavetta*). **[New Rubiaceae of the Belgian Congo (*Tricalysia, Trichostachys, Pavetta*).]** *Bull. Jard. bot. Brux.* 26 (2), 1956 (253–8). [F.] O.B.D.

159. FOSBERG, F. R. **Studies in Pacific Rubiaceae I-IV.** *Brittonia, N.Y.* 8 (3), 1956 (165–78).
Taxonomic notes on: (I) Hawaiian *Hedyotis*; (II) *Hedyotis rapensis*; (III) *Gouldia*; (IV) the Marquesan *Coprosma*.

160. LARSEN, C. M. Le rôle des stomates dans la description des races et des clones d'arbres forestiers. **[The rôle of stomata in the description of races and clones of forest trees.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/104, 1956. pp. 3 + 2 tbls. [F.]
Briefly describes investigations on length and distribution of stomata on Poplar leaves, made at the Institut de Populiculture, Grammont, Belgium, and tabulates data for *Populus tremula, P. tremuloides* (and their crosses), *P. grandidentata, P. nigra, P. deltoides* and *P. trichocarpa*. The diagnostic value of this character is established.

161. BAUER, F. Der Stand der Pappelwirtschaft in der Bundesrepublik. **[The state of Poplar husbandry in the [German] Federal Republic.]** *Holz-Zbl.* 82 (96), 1956 (1181–4). 77 refs. [G.]
A review, based on the report to the International Poplar Commission, dealing with planting, nomenclature, diseases, frost damage, yield, utilization, and breeding (including Willows).

162. CHAPMAN, E. F. **Cyprus Poplars.** [Cyprus Forest Department, Nicosia.] 1953. pp. 12 + dgm. 4 refs.
General account, silvicultural characters and increment of *Populus nigra* var. (?), *P. nigra* (hybrid), *P. alba*, and a Balsam hybrid, with some notes on recent introductions.

163. POLYCARPOU, A. **Statement prepared for the Near East Poplar Conference, Damascus April 1954.** Cyprus Forest Department, Nicosia. 1954. pp. 10 + 1 gph., 6 tbls.

Covers statistical data, policy, silviculture, pests and diseases, logging and utilization, for Poplars in Cyprus.

164. MIÈGE, J. Un nouveau *Chrysophyllum* (Sapotacée) de Côte d'Ivoire. [**A new *Chrysophyllum* [*C. azaguieanum*] from the Ivory Coast.**] *Bull. Soc. bot. France* 103 (3/4), 1956 (145–9). 6 refs. [F.] O.B.D.

165. BRENAN, J. P. M. **The genus *Cola* in Kenya, Uganda and Tanganyika.** *Kew Bull.* 1956 (1), (141–52).

A key to the species, with descriptions of *C. stelechantha, C. greenwayi, C. microcarpa, C. minor* and *C. uloloma* spp. nov.

166. HAMAYA, T. **A dendrological monograph on the Thymelaeaceae plants of Japan.** *Bull. Tokyo Univ. For.* No. 50, 1955 (45–96 + 15 photos, 6 maps). 18 refs. [E.jap.]

A descriptive list including diagnostic anatomical characters, synonymy and keys covering *Daphnimorpha, Daphne, Wikstroemia, Erioselena, Edgeworthia* and *Diplomorpha*, all small shrubs and small trees, many ornamental. The barks of the last two still produce paper for currency notes.

167. GRUDZINSKAJA, I. A. K sistematike nekotoryh vidov *Ulmus*. [**The systematics of some species of *Ulmus*.**] *Bot. Ž.* 41 (1), 1956 (97–104). 26 refs. [Russ.]

A preliminary report on studies of trees in the Ukraine, supplemented by herbarium specimens (chiefly in the Botanical Institute of the U.S.S.R. Academy of Sciences) and information from Russian and other literature, with particular reference to the names *Ulmus campestris, U. foliacea* and *U. suberosa*, concluding that the last name cannot be maintained, since neither the corky wings nor other characters, e.g. presence and colour of glands, offer any basis for specific distinction. Some observations are presented on the wide variation of characters shown by the trees in nature, and it is urged that the names *U. foliacea* and *U. suberosa* should be reduced to synonymy under *U. campestris* L. sensu Gleditsch, *U. carpinifolia* Gleditsch being rejected as unclear in application. The new varietal names *praecox* and *tardifolia* are proposed for early- and late-flushing forms of this species.

168. CARO, J. A. Las especies de *Duranta* (Verbenaceae) silvestres y cultivadas en la República Argentina. [**Wild and cultivated species of *Duranta* in Argentina.**] *Rev. argent. Agron.* 23 (1), 1956 (1–28). 117 refs. [Span.span.e.] E.M.B.

169. MOLDENKE, H. N. **Materials towards a monograph of the genus *Vitex*. V.** *Phytologia* 5 (8), 1956 (343–93). [Cf. *F.A.* 17 No. 2519.]

18. Plant Ecology

See also Nos. 116, 272.

170. MANIQUE E ALBUQUERQUE, J. DE P. Carta ecológica de Portugal. [**Ecological map of Portugal.**] Direcção Geral dos Serviços Agrícolas, Ministério da Economia, Lisboa. 1954. pp. 58. [Port.e.]

The map and explanatory notes show the climatic regions and give the species characteristic of each.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 311, 843, 850.

171. MARČIĆ, J. Sredozemni četinjari na dalmatinskom kršu. [**Mediterranean conifers in the Dalmatian Karst.**] *Šum. List* 79 (1/2), 1955 (30–6). 6 refs. [Croat.]

Describes the distribution, ecology, regeneration and pests of *Pinus halepensis, P. pinea, Juniperus* spp., *Cupressus sempervirens*, and *P. pinaster*.

172. MERENDI, A. Il pino d'Aleppo (*Pinus halepensis* Mill.). [***Pinus halepensis*.**] *Ital. agric.* 93 (5), 1956 (435–40). 3 refs. [It.] E.M.B.

A general account of the tree, its silvicultural properties, and growth.

173. MAGINI, E. Pinete di pino d'Aleppo. [***Pinus halepensis* stands.**] Accademia italiana di Scienze forestali, Firenze. 1955. pp. 20 + 4 photos. [It.]

Gives some account of the silvicultural qualities of the species, structure and development of stands, management etc. in Italy.

174. MCWILLIAM, J. R., and RICHARDS, B. N. **Caribbean Pine (*Pinus caribaea*): some notes on its development and characteristics in Central America.** In *Res. Notes Qd. For. Serv.* No. 4 [1955?] pp. 31 + 8 photos, 2 gphs. 14 refs.

An attempt to provide a background of information on *P. caribaea*, so that its behaviour and development under Queensland conditions may be better appreciated. The information is restricted to its occurrence in Honduras and British Honduras. For each of these areas information is supplied on climate, soils, and topography, and the distribution of the Pine is discussed in relation to these factors. The various characteristics of the species, form and development, phenological and wood characteristics are discussed and described, and reference is made to its management and utilization in these areas. Although in Central America *P. caribaea* is not an impressive tree, owing mainly to adverse environmental conditions, there is every indication that it will be a most successful introduction into Queensland, and it should be a welcome addition to exotic softwood species in Australia. [Cf. *F.A.* 18 No. 321.] *From authors' summary.*

175. GUILLOT, L. Le chêne pubescent en Bourbonnais. [***Quercus pubescens* in Bourbonnais.**] *Rev. for. franç.* 8 (7), 1956 (481–7 + 6 photos). [F.]

Distribution and ecology of *Q. pubescens* in Allier and neighbouring departments of France.

176. WENDELBERGER, G. Die Robinie in den kontinentalen Trockenwäldern Mittel- und Osteuropas. [***Robinia pseudoacacia* in the dry forests of Central and Eastern Europe.**] *Allg. Forstztg.* 65 (19/20), 1954 (237–9). 4 refs. [G.]

The author discusses the characteristics of the species which make it suitable for the afforestation of waste land, shelterbelts etc., but stresses particularly its dangers for the soil and the native dry forests of the region. He describes, as a warning example, the relict forests of the North Burgenland, where the native species are being crowded out. Their dense planting and the provision of heavy shade are considered the only hopeful control measures.

177. RESSINI, E. Notas sobre el 'cedro'. [**Notes on 'Cedar'.**] *Bol. for. Serv. for. Bolivia* No. 1, 1956 (27–31). [Span.]

Notes on range, growth, and natural regeneration in Bolivia of *Cedrela fissilis* which, in accessible areas, has been practically eliminated through over-exploitation.

178. LAMPRECHT, H. El cedro. [***Cedrela mexicana.***] *Bol. Ingen. for. Univ. Los Andes* 3 (11), 1956 ([i, 89]). 5 refs. [Span.]

Notes on silvicultural characters and uses of the wood.

179. POYNTON, R. J. **The silvicultural requirements of *Eucalyptus oreades* R. T. Baker (= *E. altior* Maiden).** *J. S. Afr. For. Ass.* No. 26, 1955 (67–9). 2 refs.

Adapted for planting in rainfalls of 37 in. or less in cool mountain sites with deep soils, this species is only slightly less hardy than *E. fastigata* against moderately severe frosts. Growth is rapid, the bole very straight. In spite of excoriating in long inflammable strands, susceptibility to fire, and inferior coppicing, it is recommended for live fire-breaks.

180. DOUAY, J. *Gmelina arborea* (Roxb.)—monographie. [**A monograph on *G. arborea.***] *Bois For. Trop.* No. 48, 1956 (25–38). 22 refs. [F.]

Silvicultural characters, methods of regeneration, increment and yield, and wood properties and uses.

181.1. Distribution, Natural Range

See also Nos. 4–5, 14, 157, 189–90.

181. WARDLE, P. ***Picea omorika* in its natural habitat.** *Forestry* 29 (2), 1956 (91–117 + 2 photos). 13 refs.

The paper, which is based on a visit to Bosnia in 1954 and on the literature available, describes in detail 10 of the principal surviving sites or stations of *Picea omorika* in the Dinaric Alps, and discusses the relationship of the tree to its present restricted environment. The main conclusions are that the Spruce, which is a relic in the flora of the Balkan Peninsula, succumbs to competition with other species and is poorly adapted to its present environment, but holds its own when competition is absent, as on north-facing cliffs or screes, or where it has regenerated itself after fire or exploitation. *Author's summary.*

182. ARRIGONI, P. U., and PADULA, M. Sui limiti altimetrici del leccio e del faggio in Garfagnana. [**The altitudinal limits of *Quercus ilex* and *Fagus sylvatica* in the valley of Garfagnano.**] *Monti e Boschi* 7 (7), 1956 (317–32). 6 refs. [It.f.e.]

181.2. Atmospheric Relations. Acclimatization

See also Nos. 14, 83, 157, 207, 209, 223–4, 226–7, 229, 234–5, 309 *et seq.*, 535.

183. DOWNS, R. J., and BORTHWICK, H. A. **Effects of photoperiod on growth of trees.** *Bot. Gaz.* 117 (4), 1956 (310–26). 29 refs. O.B.D.

Experiments were made with *Ulmus americana*, *Cornus florida*, *Aesculus hippocastanum*, *Acer rubrum*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Paulownia tomentosa*, *Betula mandshurica*, *Catalpa bignonioides*, *C. speciosa*, *Pinus taeda*, *P. virginiana* and *P. sylvestris*. Species differed in their response to a short (8-hour) day, ranging from *L. tulipifera*, which stopped further growth after about ten 8-hour days, to Elm, which required 20 weeks of 8-hour days before stopping growth; the average was ca. 4 weeks of 8-hour days. At higher temperatures, a longer period was required; at temperatures < 70° F. growth was inhibited even with 16-hour photoperiods. Catalpa, Elm, Birch, Red Maple and Dogwood can be kept growing continuously by day-lengths of 16 hours, whereas Paulownia, Sweet Gum and Chestnut cannot. The growth of Pine seedlings is intermittent on 16-hour days, but on 14 hours they can be kept growing continuously for nearly a year. There appears to be a balance between bud formation and elongation of newly formed structures. Many species require a cold period to break the dormant condition, but in some species, such as Catalpa, full development of this cold requirement occurs gradually. In other species, such as Dogwood, continuous light replaces the need for a cold period. In Birch the terminal bud apparently requires a cold period, but the axillary buds can be induced to resume growth by long photoperiods. The dormant condition of some species appears to be centred in the leaves, since defoliation at warm temperatures will cause resumption of growth of such species as Sweet Gum and Red Maple. This is not, however, universally the case. *From authors' summary.*

184. ZELAWSKI, W. Badania rocznej rytmiki rozwojowej rośliny drzewiastej ze szczególnym uwzględnieniem reakcji fotoperiodycznej siewek modrzewia europejskiego (*Larix europaea* D.C.). [**The yearly growth cycle of woody plants with special reference to photoperiodism in seedlings of *L. decidua.***] *Acta Soc. Bot. Polon.* 25 (2), 1956 (245–74). 37 refs. [Pol.e.] O.B.D.

Experiments devised to study the connexion between the yearly growth cycle of woody plants and day length were carried out with *L. decidua* in the laboratory. The photoperiods included uninterrupted artificial illumination and a short day of 10 hours. Observations were made on height growth, the time of setting of the apical bud, and the formation of early and late wood. As in other Larches, a reduced photoperiod induces earlier growth inhibition and adjustment to the winter rest stage. In uninterrupted illumination the seedlings showed increased growth in height and diameter, but after 3 growth periods, growth was inhibited and the seedlings died. Most rapid growth took place in the second period. The periodicity of plants kept in uniform environmental conditions

in uninterrupted day length was profoundly disturbed. The growth of seedlings in a short day was less than that of seedlings in uninterrupted illumination and less than controls. Photoperiods between 10 and 15 hours induced a similar response in seedlings. The short day had no significant effect on the length of the vegetative period in the first stages after germination. The response in the vegetative shoot only proceeded normally when photoperiodic stimulation was carried out up to the moment when the first symptoms of response appeared. Photoperiodic response did not take place when the light intensity was too low. In Larch this reponse was shown both by the interruption of growth and by the formation of the apical bud. The results show that it is possible to reduce the natural yearly life cycle of Larch seedlings to about 2 months, and thus to repeat it in laboratory conditions 6 times in one year. The cambium was more responsive to variations in photoperiodic conditions than the apical meristem. *From author's summary.*

185. OLSON, J., and NIENSTAEDT, H. **Factors controlling stem elongation in *Tsuga canadensis* (L.) Carr.** *Abstr.* in *Bull. ecol. Soc. Amer.* 37 (3), 1956 (82). A.P.B.

Temperature, photoperiod, and provenance are the factors studied. Under controlled conditions, optimum day and night temperatures occur between 17° and 27° C. Night lengths of 9 hours or more accelerate the formation of terminal buds. For any given photoperiod, ecotypes from northern seed sources generally become dormant earlier and make less annual growth than those from southern sources. Seedlings of mountain origin also have a shorter growth season than those from near-by lower elevations. Ecotypes with a long growing season, when grown in Connecticut, are much more subject to winter injury than short-season ecotypes, which harden off earlier.

186. MATSUI, Z., OSANAI, T., and ANAZAWA, H. **[The curve of stand height and ratio of height to d.b.h. in relation to site condition.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (83–93). [Jap.e.]

Gives regressions for stand height on distance from the sea coast for various forest associations, distance from the edge of the stand for Japanese Larch, and elevation above sea level for various topographical conditions. Also shown are the relations between the height/diameter ratio and stand width for *Abies mayriana*, and distance in from the stand edge for Japanese Larch. Coastal winds are estimated to have velocities of 3·8–5·8 m./sec., and stand height increases with stand width and with distance from the coast line. A table gives, for 69 localities, the altitudes to which the managed forest and tree limits reach.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 22–6, 35–9, 82–4, 232, 244, 267, 310, 323, 325, 545, 1201.

187. VLOTEN, H. VAN. Samenvatting van voordrachten en discussie over de japanse lariks in de bijeenkomst van de studiekring op 10 en 11 December 1954. **[Summary of papers and discussion on Japanese Larch during a meeting of the study circle, 10–11 Dec. 1954.]** *Ned. Boschb.-Tijdschr.* 27 (1), 1955 (20–2). [Du.]

Subjects include: stem form and soil fertility; influence of Ca, of N, and of varying soil moisture on growth; the growth check at 15–20 years; prices and rotation; insect damage; and special conditions in N. Brabant.

188. FRÖHLICH, T. Standortsansprüche der europäischen Lärche. **[Site requirements of *Larix decidua*.]** *Allg. Forst- u. Jagdztg.* 126 (4), 1955 (76–81). 13 refs. [G.g.e.]

A general discussion, opposing the view expressed by Schober [see *F.A.* 12 No. 2504] and others, that Larch requires very good sites with deep loamy soils, and illustrating the author's contention that it is suitable for certain poor sites, chiefly on stony or skeletal soils on steep, windy slopes in a continental climate, by data from 5 such sites, mostly on grauwacke, in the Eder mountains in Hesse, where Larch at ca. 100 years does better than Beech, Oak or Pine of similar age.

189. FLETCHER, P. W., and MCDERMOTT, R. E. **Influence of geologic parent material and climate on the distribution of Shortleaf Pine in Missouri.** *Abstr.* in *Bull. ecol. Soc. Amer.* 37 (3), 1956 (82–3). A.P.B.

Within the Oak/Hickory association of the Missouri Ozarks, Shortleaf Pine is a major component of the forest where sandstone is the underlying rock. The Pine is most abundant where the sandstone occurs in well dissected terrain; it is not found on broad, flat ridges, and only sparsely on gently rolling uplands. These peneplain remnants are characterized by stands of Post Oak, and Lebanon silt loam is the prevailing soil type. The major Pine-bearing stratum of the Missouri Ozarks is Roubidoux sandstone, associated with Clarksville stony loam. The main factors defining the perimeter of the range are the up-section occurrence [outcropping?] of dolomite, gentle relief and/or low winter precipitation.

190. MCMILLAN, C. **The edaphic restriction of *Cupressus* and *Pinus* in the coast ranges of Central California.** *Ecol. Monogr.* 26 (3), 1956 (177–212). 38 refs.

In the vegetation of this region there are many examples of narrowly restricted species. The entire range of a species is often confined to an area of serpentine soil or to an area of highly acid soil. Different responses to serpentine soils were demonstrated by the edaphically restricted members of various genera. Five closely related members of a species-complex in the genus *Cupressus* (*C. sargentii*, *C. pygmaea*, *C. abramsiana*, *C. goveniana*, and *C. macrocarpa*) differed only slightly in their response to a serpentine soil, an acid soil, and a control soil. On the other hand, members of a species complex in the genus *Pinus* (*P. bolanderi*, *P. contorta* and *P. attenuata*) responded variously to these soils. Similar inconsistencies were found between genera of annual and perennial herbs and grasses. These

studies strongly suggest that a plant community is the result of the overlapping of different tolerance ranges of the component individuals for the environmental conditions presented by a particular habitat.

191. YAMAMOTO, T., and SHIOZAKI, M. [**Studies of proper sites for Todo-Fir [*Abies mayriana*] in Hokkaido. VIII. The soils of Todo-Fir forest in Kotanbetsu Region.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (12–7). [Jap.jap.e.]

Gives mechanical and chemical analyses of soils under: Todo Fir with and without advance reproduction, Japanese Oak/Todo Fir and *Betula ermani*/Fir. The pH, C, N, and Ca were higher and the C/N ratio lower under the hardwood mixtures, and better conditions for Fir regeneration can be found there.

192. BÖSZÖRMÉNYI, Z. Az erdeifenyö csemeték ásványi táplálkozása. I. [**Mineral nutrition of Scots Pine nursery plants. I.**] *Agrokémia és Talajtan, Budapest* 5 (1), 1956 (75–88). 28 refs. [Hung.russ.g.e.] H.S.B.

The effect of N supply on the growth and chemical composition of nursery plants was studied. Two different nutrient solutions were used in sand cultures, each solution with 5 different N levels. The N levels in the second solution were double those in the first. At the lowest N levels a characteristic red colouring of the needles was observed. The data for amounts of dry matter show differences in the response of shoot and root to N fertilizers. Since the increase in dry-matter content of roots is substantially slower than that of the shoot, the root/shoot ratio decreases with increasing N level, until about 180 p.p.m. is reached, when it becomes constant. The increase in dry-matter content and number of laterals is characteristic of increased use of N fertilizers and so, in some measure, may serve as an index of N supply. The most suitable material for determining N supply is the leaves. In nutrient solutions of the same P content, P% at first follows the increase of N supply, but later decreases. The change in K% is similar. Ca and Mg show a tendency to decrease. Under experimental conditions, critical N supply was found to be between 1·8 and 2% in leaves, 1·3 and 1·6% in roots, 1·2 and 1·5% in stems, and 1·7 and 1% in the whole plant. The data show the possibility of changes in critical N concentration as a consequence of changing the amounts of other nutrients. *From author's summary.*

193. SEBALD, O. Über Wachstum und Mineralstoffgehalt von Waldpflanzen in Wasser- und Sandkulturen bei abgestufter Azidität. [**The growth and mineral content of forest plants in water and sand cultures of graded acidity.**] *Mitt. württemb. forstl. VersAnst.* 13 (1), 1956. pp. 83. 72 refs. [G.g.]

Twenty-six species, chiefly from the forest floor, were grown in water or sand (or sandy loam) fertilized with complete nutrient solutions, the pH being varied between 3 and 8. The results in terms of height growth, root development, dry-weight production and chemical contents of foliage are presented in graphs and tables and the species grouped according to their reactions to slightly alkaline conditions and to their pH ranges of healthy growth. The differences and correspondences between experimental and ecological behaviour are discussed. The two tree species investigated, *Acer pseudoplatanus* and *Fraxinus excelsior*, both grown in sand as 2-year seedlings, showed optimum growth at pH 7, with unexpected checks at pH 8. The Ca, Mg, Mn, K and P content of leaves in relation to pH of the culture medium was analysed for 6 species.

194. TSUDA, K. [**Manure examination for *Larix* (VII). The effect of pH on the growth of Japanese Larch seedlings.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (1–5). 4 refs. [Jap.jap.e.]

Larch seedlings were grown in water of pH 4, 5, 6, 7 and 8. At pH 4 the green weight of leaf, stem and root, and the uptake of N, P and K were lowest. At pH 5 all these values were highest. With increasing alkalinity they all decreased, but they were not as low at pH 8 as at pH 4. The dry matter % weight of the 3 elements was not distributed so regularly.

195. KURAMOTO, M., TSUDA, K., and SHODA, T. [**Manure examination for *Larix*. (VII) [VIII?] Studies on the effects of pyroligneous acid upon growth of *Larix leptolepis* seedlings.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (6–11). 4 refs. [Jap.jap.e.]

Applications of this acid to volcanic soil (physical and chemical composition given) gave better results in seedling shoot-growth than acetic and sulphuric acid, through stimulating nutrient uptake. The absorption of N, P, and K was in the normal growth ratio of 3 : 1 : 2. Organic acids decreased the N/P ratio, probably through P absorption by the soil.

196. ZEMLJANICKIĬ, L. T. Vzaimosvjazj lesa i počvy v stepi i lesostepi. [**The interrelation of forest and soil in the steppe and forest-steppe.**] Goslesbumizdat, Moscow. 2nd ed. (rev.). 1954. pp. 63. 21 refs. [Russ.]

A semi-popular educational booklet with chapters on the soils of the steppe and forest-steppe regions of the European part of the U.S.S.R., the relation of tree and shrub species to steppe soils, and the influence of tree stands on steppe and forest-steppe soils.

197. SANDRI, G. I terreni della pineta demaniale del litorale ravennate. [**The soils of the state Pine forest of the Ravenna coast.**] *Ital. for. mont.* 11 (1), 1956 (36–42). 6 refs. [It.it.f.]

Gives chemical analyses and describes the profiles of soils in these plantations, established on coastal sand-dunes at various periods during the past 100 years, and compares them with the neighbouring ancient Pine stands of S. Vitale and Classe.

198. SANDRI, G. I terreni delle pinete di S. Vitale e di Classe (Ravenna). [**The soils of the Pine woods of S. Vitale and of Classe, near Ravenna.**] *Ann. Accad. ital. Sci. for.* 4, 1955 (295–313). 10 refs. [It.f.]

The author made a pedological study of the soils under these two *Pinus pinea* stands and describes

some of the profiles. On the basis of variations in content of carbonates from north to south, it is concluded that alluvium from the River Po influenced the formation of the soils of S. Vitale, and alluvium from Alpine torrents that of Classe. He also studied the content of active Ca in order to elucidate the adaptation of *P. pinea* to these soils rich in carbonates.

199. OVINGTON, J. D. **Tree species and site factors.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/17, 1956. pp. 4 + 1 tbl., 5 dgms.

Gives preliminary results of investigations (mainly in experimental plantations at Bedgebury) into the effects of various exotic species on microclimate (interception of rainfall and light intensity) and soil development. Tabulated data are given of C, N, K, Na and P content of the upper 5 cm. of soil under *Quercus sessiliflora*, *Q. rubra*, *Picea abies* and *Tsuga heterophylla*, and diagrammatic representations of interception of rainfall and light by the same species. Tabulated data are also given from chemical analysis of (*a*) branchwood, (*b*) stemwood of the same species, showing kg./ha. of C, N, Na, K, Ca, Mg, Fe, Mn, Si, and P. These preliminary results show that site factors are modified differentially by different tree species but that there is no sharp distinction between native and exotic species.

200. ORCHARD, E. R., and DARB, G. D. **Fertility changes under continued Wattle culture with special reference to nitrogen fixation and base status of the soil.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *D*, 1956 (305–10). 6 refs. [E.e.g.f.]

A number of soils under plantations of *Acacia decurrens* var. *mollissima* on varying parent materials were compared with neighbouring veld soils for their content of N and exchangeable bases. Results showed that over 30 years the average annual N enrichment of the soil under *A. mollissima* was 180 ± 40 lb. N/acre. A regression equation derived from the results allows the calculation of N content in plantation soils from that in neighbouring veld soils. No significant difference was found between total Ca, Mg, Na and K in plantation and veld soils.

201. RAMASWAMY, M. N., and GOWDA, D. R. **The humus content of laterite soils in the tropical evergreen forests of Mysore.** *Indian For.* 82 (8), 1956 (395–8).

These soils occur at an altitude of ca. 3000 ft., in a region with mean temperature ca. 27° C. and annual rainfall ca. 350 in. almost confined to the 4-month period June–Oct. Soil samples were taken from (*a*) a sample plot of undisturbed forest and (*b*) an adjacent 'D' line, the date at which the latter was first cut being known. The soil on (*b*) had been exposed ever since the line was cut [period not stated]. Comparison of samples from litter layer, 0–4 in., 4–12 in., and 12–24 in., showed that (*b*) was strikingly inferior to (*a*) at all levels in moisture, organic matter, N, and Ca. There was little variation in pH at different levels (6·1–6·7) and none between (*a*) and (*b*).

202. BOND, G., MACCONNELL, J. T., and MCCALLUM, A. H. **The nitrogen-nutrition of *Hippophae rhamnoides* L.** *Ann. Bot., Lond.* 20 (79), 1956 (501–12 + 2 plates). 12 refs. O.R.E.

Plants removed at the 6-leaf stage from a culture medium containing N to an N-free medium, and inoculated with crushed nodules from other *Hippophae* plants, developed nodules and grew satisfactorily, fixing up to 79 mg. of atmospheric N in 7 months' growth. Nodule formation was affected by low pH, and reduced by the presence of N in the medium. Earlier inoculation had no effect. Controls without nodules grew better in media containing N but hardly at all in N-free media. [Cf. *F.A.* 17 No. 1333.]

203. LEVISOHN, I. **Effect of mulching on mycorrhizal fungi.** *Emp. For. Rev.* 35 (3), 1956 (320–1). 6 refs.

In pot cultures of Pine and Spruce covered with a heather mulch, dense mats of mycelium formed round the root-ball of the plants after 18 months. Field observations showed that sporophores of mycorrhizal fungi developed near young trees of Norway Spruce, Birch and Lawson Cypress under a bracken or heather mulch 1 year after mulching. As pots of mulched soils alone did not develop a mycelial mat, it would appear that mycelial growth is caused not by the mulch alone but by the new conditions created by the mulched tree.

204. BERGEMANN, J. Die Mykorrhiza-Ausbildung einiger Koniferen-Arten in verschiedenen Böden. [**The development of mycorrhizae of some conifers in different soils.**] *Z. Weltforstwirt.* 18 (5/6), 1955 (184–202 + 15 colour photos). 26 refs. [G.g.e.]

Describes a 3-year experiment during which seedlings of *Pinus sylvestris*, *P. patula*, *Picea abies*, *P. sitchensis*, *Larix decidua* and *L. leptolepis* were grown in the greenhouse in pots filled with (*a*) fine sand from a wasteland site, (*b*) loamy sand from a field cultivated for ca. 100 years and (*c*) loamy, humous sand (mixtures of the A_0, A_1, and part of the B horizon) from 3 forest soils. Mechanical and chemical soil analyses are given; (*a*) was a podzol, (*b*) and (*c*) were podzolic brown earths. Growth data and dry weights of aerial parts and roots are compared in each case with the morphological and anatomical development of the mycorrhizae. The form of mycorrhiza typical of the individual tree species remained unchanged in all of the soils, but colour, thickness, branching and forking, and vigour of mycelial growth varied considerably with soil type. In (*a*), dark colour of mycorrhizae, absence of fungus mantles, strong intracellular infection in autumn, and moderate infection of long roots, were accompanied by poor growth in all test species. In (*b*) only the Pines, which did moderately well, showed fungus mantles, weak intracellular infection, and no infection of the long roots, while the Spruces, without mantles and with moderate to strong intracellular and strong long-root infection, did hardly (if at all) better than in (*a*), and the Larches, though somewhat better, behaved similarly. In (*c*) all species flourished and had broad mantles,

intracellular infection was weak, and infection of long roots mostly light.

205. WAGENKNECHT, E. Wurzeluntersuchungen und ihre Bedeutung für standortgerechten Waldbau. [**The importance of research on roots for silviculture correctly adjusted to site.**] *Arch. Forstw.* 4 (5/6), 1955 (397–406). 13 refs. [G.]

A lecture, drawing on 4 unpublished theses for examples of the use of rooting space by Spruce, Douglas Fir, Larches, Beech, Red Oak, and Scots and Weymouth Pine in sands overlying loams at various depths at Eberswalde. The nursery-scale experiment of Rahteenko [cf. *F.A.* 13 No. 142] is quoted to show the influence of mixtures on the root growth (and thus on the aerial parts) of the Oak. Taking the root weight of Oak in a pure stand as 100, the relative weights of its roots in mixture with Norway Maple, *Caragana* [*arborescens*], *Robinia* and Ash were respectively 123, 90, 40 and 14. The chief object of these researches into the sociology of root systems is to indicate for each site what species mixtures will use the whole of the available rooting space of a particular site most efficiently for maximum volume and value increment consistent with conservative soil use.

206. RUIGE, P. N. Wortelontwikkeling van japanse lariks. [**Root development of Japanese Larch.**] *Ned. Boschb.-Tijdschr.* 27 (2), 1955 (29–38). 6 refs. [Du.e.]

Root development of 4–7 trees was examined in 3 mixed stands established 20 years earlier, after cultivation and manuring, on heathland in Apeldoorn. In two stands, one sown and one planted, root development was strong in two layers, with superficial roots springing from the taproot in the upper 10–15 cm., and deep roots at 25 cm. The layer structure is attributed to the dryness of the cultivated soil to a depth of 20 cm. The top layer of roots was close to the water-retaining litter layer and the lower layer of roots at the undisturbed B horizon, where water is more readily available. In the planted stand, roots of the surface layer were dense but less strong, in the sown stand they were fewer but longer; the difference is attributed (1) to damage and subsequent formation of adventitious roots during transplanting and (2) to greater root competition in the sown stand. The third stand (sown) was on a brown podzolic soil; root development was poorer and lacked the 2-layered form shown in the other two stands, which were on soils little subject to leaching.

207. POTAPOV, N. G. A hömérséklet hatása a tölgy-csíranövények gyökerének növekedésére. [**The influence of temperature on root growth in Oak seedlings.**] *Agrokémia és Talajtan, Budapest* 5 (1), 1956 (69–74). 6 refs. [Hung.russ.f.g.] H.S.B.

In the root meristem the process of division, differentiation, and synthesis of living matter begins at 0–5·3° C. At this temperature level, the meristem of the stem is still dormant. At 8–10° the root is developing fast, while growth of the stem is beginning slowly. At this stage the rate of synthesis of organic matter is 7 times as much in the root as in the stem. At a temperature of 18–20° the root synthesizes 1½ times as much organic matter as the aerial parts. *From author's summary.*

208. BARNER, J. Das Wurzelsystem der Pflanze als Kriterium für die physiologische Flach- und Tiefgründigkeit eines Standortes dargestellt an den Ergebnissen eines experimentellen Robinienanbaus am südlichen Oberrhein. [**The root system of plants as an indicator of the depth of soil physiologically available, illustrated by experiments with Robinia in the southern Upper Rhine region.**] *Allg. Forst- u. Jagdztg.* 125 (7), 1954 (245–7). 9 refs. [G.g.e.]

Analyses 2-year-old root systems of planted stock, distinguishing various morphological types of growth and of disturbance, which latter may indicate future checks to the growth of the tree. Root analysis of trial plantings on difficult sites should help to avoid failures.

209. RICHARDSON, S. D. **Studies of root growth in *Acer saccharinum* L. III. The influence of seedling age on the short-term relation between photosynthesis and root growth. IV. The effect of differential shoot and root temperatures on root growth.** *Proc. ned. Akad. Wet.* 59*C* (3), 1956 (416–38). [E.e.] O.R.S.

(III) Experiments subjecting seedlings to various light intensities showed that the close relation already found between photosynthesis and root elongation does not hold throughout the life of the seedling. Immediately after germination, rate of root growth is determined by the level of reserves in the cotyledon. At the end of the first growing season it is determined, at least partly, by storage products, and in 2nd-year seedlings the reserve carbohydrates determine both root growth and the time lag before reaction to an unfavourable environment. (IV) First-year seedlings grown under constant conditions of light, root temperature and shoot day-temperature, but different shoot night-temperatures, showed an inverse relation between root elongation and shoot temperature $> 10°$ C. When the shoot temperature was kept constant at 20°, root growth was inhibited by root temperatures of $> 20°$. [Cf. *F.A.* 15 No. 147.]

210. SILVA, S. L. DE OLIVEIRA E. Orgãos subterrâneos de algumas plantas psamófitas. [**The subterranean organs of some psammophytic plants.**] *Arq. Serv. flor., Brasil* 9, 1955 (93–177). 45 refs. [Port.]

Information is given from a study at Sernambetiba [cf. *F.A.* 9 No. 2116] on the following sand-dune species: *Iresine portulacoides, Telanthera maritima, Canavalia obtusifolia, Ipomoea pes-caprae, I. acetosaefolia, Diplothemium maritimum, Euphorbia brasiliensis, Polygala cyparissias, Sporobolus virginicus, Remirea maritima, Stenotaphrum glabrum* var. *americanum* and *Panicum racemosum.* A classification of these species into 5 groups is suggested.

211. ŠAFAR, J. Sraščivanje korijenja. Biološko i ekonomsko značenje nekih odnosa drveća u šumskoj pedosferi. [**Natural root grafting. Its biological and economic significance in some root relations of trees.**] *Šum. List* 79 (11/12), 1955 (563–78). [Croat.croat.g.]

Investigations in natural forest of *Abies alba* in Croatia showed that (1) the proportion of living stumps is a function of the distance from the nearest living individual, (2) more living stumps (for the same distance) are found on soil overlying limestone than on soil overlying a siliceous bedrock. In *Picea abies*, root-grafting rarely leads to the survival of stumps, and sometimes even kills the tree. For *Fagus sylvatica* similar trends were observed to those in *A. alba*, although the survival figures and critical (maximum) distance are smaller. Data are tabulated, with illustrations. The effect of living stumps on soil processes and transpiration is also discussed.

212. Molotkov, P. I. Podvižnostj pasoki v vodoprovodjaščeĭ sisteme dereva i soobščaemostj meždu derevjjami, imejuščimi kornevuju svjazj. **[Sap movement in the water-conducting system of trees and interconnexions between root-grafted trees.]** *Bot. Ž.* 41 (3), 1956 (407–9). [Russ.]

Solutions of 5% $CuSO_4$, 10% $(NH_4)_2SO_4$ or Fe SO_4 injected near the root collar of *Populus tremula* and *Fagus sylvatica* also killed neighbouring trees of the same species up to 7 m. away. Root grafting was proved in all cases.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also No. 245.

213. Filho, O. A. Gurgel. Nota prévia sôbre a competição de espécies de eucaliptos para lenha. **[Preliminary note on competition between species of *Eucalyptus* grown for timber.]** *Rev. Agric., Piracicaba* 31 (2), 1956 (83–4). 5 refs. [Port.] A.P.B.

Growth in 12 plots of mixed *Eucalyptus alba, E. saligna* and *E. grandis* spaced 2 × 2 m. was analysed 18 months after planting in order to study possible competition between the species. All species were remarkably uniform in both height and diameter increment.

214. Goršenin, N. M. Zakonomernosti vnutrividovyh vzaimosvjazeĭ v čistyh molodnjakov sosny, eli i pihty. **[Relations between trees of the same species in pure sapling stands of *Pinus sylvestris, Picea abies* and *Abies alba*.]** *Bot. Ž.* 41 (2), 1956 (221–9). [Russ.]

The effects of excessive stand density on growth were studied on 4 plots laid out in abandoned, untended nursery beds in Lvov and Ternapol districts, all on sites judged to be of the first quality-class: (*a*) 9-year Pine, density equivalent to 92,000/ha.; (*b*) ditto, 216,000/ha.; (*c*) 15-year Silver Fir, 107,000/ha.; (*d*) 13-year Spruce, 1,323,000/ha. On each plot 200 trees were measured (diameter, height, and height increments for the last 7–11 years) and divided into 3 height classes, for each of which 3 sample trees were felled and analysed. Results, given in tables and graphs, show that the mean height at the time of measurement in all cases corresponded to that of site-class III. Questions of self-thinning and differentiation in height are discussed at some length. Height differentiation in such stands at first decreases with age but later begins to increase gradually, the incidence of these phases varying with species. For adverse sites where close, regular spacing may check height growth uniformly throughout the plantation, it is suggested that 3–4 closely spaced rows of plants should alternate with unplanted strips 1·5–3 m. wide.

181.5. Reproductive Behaviour

See also Nos. 296 *et seq.*

215. Pijl, L. van der. **Remarks on pollination by bats in the genera *Freycinetia, Duabanga* and *Haplophragma*, and on chiropterophily in general.** *Acta bot. neerland.* 5 (2), 1956 (135–44 + 2 plates). 21 refs. O.B.D.

216. Sarfatti, G. Il ciclo riproduttivo del pino laricio in Sila (Calabria). **[The reproductive cycle of *Pinus nigra* var. *calabrica* in Sila (Calabria).]** *Ann. Accad. ital. Sci. for.* 4, 1955 (249–77). 42 refs. [It.f.]

Observations on *P. nigra* var. *calabrica* and *P. nigra* var. *austriaca*, both in Italy and in Chicago, lead to the conclusion that there is a genetical difference in the reproductive cycle of the two varieties.

217. Heron, R. J. **Jack Pine staminate flower production.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (2).

Describes two instances of *Pinus banksiana* failing to produce staminate flowers in the year following severe defoliation by *Cacoecia pinus*.

218. Tjurin, A. V. Hod zacvetanija sosny obyknovennoĭ v evropeĭskoi časti SSSR (s 1948 po 1954 g.). **[The flowering time of *Pinus sylvestris* in the European part of the USSR (1948–1954).]** *Bot. Ž.* 41 (4), 1956 (568–71). 1 ref. [Russ.]

Tabulates observed flowering dates for 13 localities in various parts of the country, and presents a sketchmap with 'isolines' of probable flowering date, ranging from ca. 11 June in the N. to 12 May in the S.

219. Fielding, J. M. **Notes on the flowering and seeding of *Eucalyptus delegatensis* and *E. fastigata* in the Australian Capital Territory.** *Aust. For.* 20 (1), 1956 (40–3). 2 refs.

220. Corti, R. Ricerche sul ciclo riproduttivo di specie del genere *Quercus* della flora italiana. II. Contributo alla biologia ed alla sistematica di *Quercus suber* L. e in particolare delle forme a sviluppo biennale della ghianda. **[The reproductive cycle of Italian species of *Quercus*. II. Biology and systematy of *Q. suber* with special reference to the forms with biennial development of acorns.]** *Ann. Accad. ital. Sci. for.* 4, 1955 (56–133 + 16 plates). 77 refs. [It.f.] [Cf. *F.A.* 17 No. 2577.]

221. Nikolaeva, M. G. Biologija prorastanija semjan bereskleta v svjazi s ego vidovymi osobennostjami i geografičeskim proishoždeniem. **[The biology of germination of *Euonymus* spp. in relation to specific characteristics and provenance.]** *Bot. Ž.* 41 (3), 1956 (393–403). 12 refs. [Russ.]

The germination of 13 species growing in the U.S.S.R. was studied, and as a result they were divided into 5 groups according to the length of dormancy, ranging from *Euonymus nanus*, requiring virtually no dormant period before germination, to

E. verrucosus, which needs 2–3 months' 'warm' (15–25° C.) stratification followed by 3–4 months' cold stratification to break its dormancy. The length of dormancy is probably determined by the climatic conditions in which the species originate. Absence of a dormant period in seeds of *E. nanus* suggests that it originated in a warm and damp climate. Seeds of East Asian spp. e.g. *E. maackii*, *E. hamiltonianus*, *E. semiexertus*, *E. bungeanus* (requiring only 2–4 months' cold stratification) and seeds of Mediterranean spp. e.g. *E. verrucosus* and *E. sacrosanctus*, still retain the length of dormancy appropriate to their country of origin. The germination of 11 species under various stratification treatments is shown in graphs.

222. BULARD, C. Physiologie et évolution à propos de la germination de quelques gymnospermes. **[Physiology and evolution related to germination of some gymnosperms.]** *C.R. Acad. Sci., Paris* 243 (6), 1956 (599–600). 5 refs. [F.] O.R.S.

In vitro experiments on germination and seedling development showed that species with hypogeal germination (*Ginkgo biloba*, *Araucaria imbricata*, and *Cycas revoluta*) grew much less successfully in culture than *Pinus pinea* and *Cedrus atlantica*.

223. STEARNS, F., and OLSON, J. **Seed germination characteristics of *Tsuga canadensis* (L.) Carr.** *Abstr.* in *Bull. ecol. Soc. Amer.* 37 (3), 1956 (81–2). A.P.B.

At 17° C., germination was low in darkness, higher with 8 or 12 hours of light daily, and again low with 16 hours of light. Above 17° it was markedly reduced at all photoperiods, with the 16-hour day becoming more favourable than the 0-, 8-, or 12-hour days. Below 17° it was delayed and showed little correlation with photoperiod. Seed from southern sources required less time for stratification and had greater tolerance of high temperatures during germination than seed from northern sources.

224. VAARTAJA, O. **Photoperiodic response in germination of seed of certain trees.** *Repr.* from *Canad. J. Bot.* 34, 1956 (377–88). 18 refs.

The full version of the abstract noticed in *F.A.* 17 No. 2579.

225. BERNTSEN, C. M. **Seedling distribution on a Spruce-Hemlock clearcut.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 119, 1955. pp. 7. 2 refs.

After the clear felling in 1947 of a Spruce/Hemlock stand (Cascade Head Experimental Forest, Oregon), 160 milliacre regeneration plots were established in 1951. Five categories of seedbeds comprised: (1) rotten and decomposing wood, (2) mineral soil, (3) surface covered with slash, (4) heavy vegetation, (5) swampy ground. Examination in March 1954 showed Spruce regeneration on 53 and Hemlock on 44% of the total area of the plots. Best conditions were provided by (1) (97% stocked) and (2) (83%); (5) was unstocked. There were more than twice as many seedlings on plots with a N. than in those with a S. aspect. Accumulations of slash were found to retard growth of trees and other vegetation.

226. HUNZIKER, T. Ökologische Untersuchungen über die natürliche Föhrenverjüngung im nordostschweizerischen Mittelland. **[Ecological investigations into the natural regeneration of Pine in the region of medium elevation in N.E. Switzerland.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 32 (3), 1956. pp. 145 + 1 plate + 5 tbls. 98 refs. [G.it.f.e.]

Plant-sociological analyses were made on macro- and micro-sites in two regeneration areas, one in a mixed hardwood region (a dry, acid site, now rather lightly stocked with 120-year-old Scots Pines and a (predominantly) Beech understorey), the other in a Beech region (now stocked with 100- to 120-year-old mixed conifers and a mixed understorey, more shaded and moist, and less acid). The analyses were supplemented by nursery and greenhouse experiments on the effect of ground cover, soil scarification, and light and moisture conditions on the germination, survival and development of Pine of two provenances. These tend to confirm the findings in the field that light was the most important ecological factor, that a ground cover of low density but great variety of species was most favourable, and that on a moist and shaded site the drier and lighter spots are favoured, and *vice versa*. Implications for silvicultural treatment and tending are discussed.

227. DOWELL, M. H. D. **The influence of shade on certain tree seedlings, with particular reference to the regeneration of Beech.** *J. Oxf. Univ. For. Soc. Ser. 4* No. 4, 1956 (32–42). 5 refs.

In an attempt to study the effect of decreasing light intensity on certain tree seedlings, some of reputedly 'tolerant', some of 'intolerant', species, root competition was controlled and soil conditions were maintained at optimum level. One-year-old transplants of *Fagus sylvatica*, *Tsuga heterophylla*, *Abies concolor*, *Picea sitchensis*, and *Pinus sylvestris*, were grown at Kennington nursery, Oxford, for one year, using 3 replications of 4 degrees of shade, 0%, 34%, 54% and 78% of the light being excluded. Measurements were made of dry-weight increments, height growth, root/shoot ratios, mortality, leaf weights and lengths, and weed growth was also assessed. Some naturally occurring Beech seedlings were compared with similarly shaded nursery plants, and the effect of biotic and edaphic factors acting independently of light intensity were evaluated. No great difference was found between the behaviour, as a whole, of 'tolerant' and 'intolerant' species under shading treatment during the single growing season in which they were studied, although a significant difference in survival might have become apparent after another year.

Dry-weight increase was found to be approximately proportional to light intensity up to full illumination, and only in Hemlock and Pine was height growth greatest under slight shade. The root/shoot ratio was depressed by shading in all species except Fir (*Abies concolor*), and changed during the growing season in all species except Pine. It was also concluded that natural regeneration of Beech at Burnham Beeches was likely to benefit more from improvement in soil texture than from any further thinning of the canopy. *Author's summary.*

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 185–7, 213–4, 310.

228. LITTLEFIELD, E. W. **More on late seasonal growth of Red Pine.** *J. For.* 54 (8), 1956 (533). 3 refs.

Draws attention to work by Jump (*Phytopathology* 28, 1938 (798–811)) suggesting that 'the abnormal bifurcation of a Pine bud may be initiated through the action of a phytohormone produced by the fungus [*Dematium pullulans*] living within the tissues'. From foresters' reports in N.Y. State it is established that forking takes place on class II sites when the tree has reached a height of 3–4 ft., and that it can be checked by pruning. [Cf. *F.A.* 17 No. 3732.]

229. IVANOVA, N. E. Rost dubovyh molodnjakov na temnoseryh lesnyh suglinistyh počvah nagornyh dubrav lesostepi. (Po issledovanijam v Tellermanskom lesu.) [**Growth of young Oak stands on dark-grey clay-loam forest soils in the upland Oak regions of the forest-steppe. (Based on observations in the Tellerman Forest).**] Akademija Nauk SSSR, Moscow. 1953. pp. 167. 72 refs. [Russ.] Price *Roubles* 7·20.

Includes chapters on silvicultural and ecological characters of *Q. robur* var. *praecox* and *Q. robur* var. *tardiflora*; general observations on shoot growth during the growing season, with special reference to the distinction between the first and the subsequent shoots ('Lammas' growth in June–July); the influence of weather and light on shoot growth, with particular reference to the different shoot types, in plantations; the influence of side shade on height growth; the influence of light in young natural stands; diameter growth during the growing season; the influence of weather and light on the diameter growth of late-flushing forms; and the influence of light on stem and crown formation in young Oaks.

181.8. Phenology

See also Nos. 83, 120, 183–5, 218, 223–4, 228–9.

230. ANIĆ, M. Rhythmus des Höhenwachstums bei Pflanzen verschiedener Holzarten im Laufe ihrer Vegetationsperiode. [**The rhythm of height growth of various tree species in the course of their growing season.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/11/101, 1956. pp. 5 + 4 dgms., 2 tbls. [G.]

Presents results of weekly measurements on plants aged 0–24 years of 10 coniferous and 23 broadleaved species, taken at Zagreb for the last 10 years in the University's forest garden. *Pinus sylvestris*, *Abies alba*, *Sorbus aucuparia* and *Fraxinus ornus* were among the species with the shortest vegetation period. *Larix decidua* and *Populus nigra* had the longest for conifers and broadleaved species respectively. Lammas-shoot formation occurred in individuals of all broadleaved and many coniferous species, in some more than once. In general, those forming such shoots grew for a longer period, but total increment was generally less than in plants of continuous growth of the same species. Most plants had their greatest growth early in the season, young plants reaching their maximum increment earlier than saplings. Some species, particularly those with short growing seasons, such as *P. sylvestris* or *Fagus sylvatica* are little, and others, particularly those with long growing seasons, are much influenced by ecological and climatic factors.

231. FRENI, C. Andamento del ritmo vegetativo in *Abies alba* Mill. dell' Aspromonte. [**The course of the growth cycle in *Abies alba* from Aspromonte.**] *Ann. Accad. ital. Sci. for.* 4, 1955 (135–55 + 3 plates). 14 refs. [It.f.]

The author's observations on Silver Fir of Calabrian and of Tyrolese origin grown in Sicily, confirmed the findings of Ciampi and Susmel on the differences between the two provenances. [Cf. *F.A.* 16 Nos. 2783–4.]

232. FIELDING, J. M. **The seasonal and daily elongation of the shoots of Monterey Pine and the daily elongation of the roots.** *Leafl. For. Timb. Bur. Aust.* No. 75, 1955. pp. 22. 10 refs.

Shoot elongation was studied on eight 7-year-old *Pinus radiata* at Canberra, measurements being made at weekly or fortnightly intervals. The general course of growth of purely foliar shoots was a period of rapid spring growth followed by negligible or very slow growth during the rest of the year. The pollen-producing shoots elongated almost throughout the year. On each of the young trees studied, active spring growth of all shoots began at about the same time, except for third-order shoots and shoots near the ground, active growth of which began later. The end of active spring growth was progressively later with height up the stem. Daily variation in elongation of shoots and roots was studied on two 7-year-old trees, about 20 ft. high. It was found that elongation of the apical shoot varied greatly from day to day, and was strongly influenced by temperature. Rate of elongation was much faster between 3 p.m. and 9 a.m. than during the daylight hours of 9 a.m. to 3 p.m., fastest growth occurring between 3 p.m. and midnight. During the day, the apical shoot sometimes shrinks in length. During the period studied the daily rate of growth of the roots varied with the daily rate of shoot growth and was also faster at night than during the day.

233. **Is bud bursting under close genetic control in Douglas Fir?** *Rep. Pacif. Nthwest. For. Range Exp. Sta. 1955*, 1956 (67).

Observations in 1955 on 3 plantations containing 40-year-old progeny from the same 13 seed sources showed that the same order of bud bursting prevailed at Wind River at 1100 ft. as later at Mt. Hood at 2600 and at 4600 ft. Apparently changes in altitude and latitude do not change inherent earliness or lateness of bud bursting of Douglas Fir. This relationship is being tested in a more closely controlled study at the McDonald Forest, Corvallis.

234. PAULEY, S. S. **Influence of light on break of dormancy in various tree species.** *Abstr.* in *Genetics, Madison* 39, 1954 (987). L.S.

When small branches from various clones were grown in uniform temperature in (*a*) continuous

light, (*b*) natural day, and (*c*) continuous darkness, Poplars showed no significant differences. Birch, Cherry, Maple and Ash species broke dormancy in all cases (with delays for (*c*) up to 16 days) but the Fagaceae tested (Oak, Chestnut and Beech) failed to do so in (*c*). No significant differences between (*a*) and (*b*) were found for the species tested. [Cf. *F.A.* 15 No. 3269.]

235. PAULEY, S. S. **Variation in time of break of dormancy among altitudinal ecotypes of *Populus trichocarpa*.** *Abstr.* in *Genetics, Madison* 39, 1954 (986–7). L.S.

Whereas short-growing-season ecotypes from high latitudes are characterized by precocity, short-growing-season ecotypes from high altitudes, when grown under uniform temperature and day-length conditions, proved significantly less precocious than low-elevation, long-growing-season ecotypes. [Cf. *F.A.* 16 No. 202.]

236. SCHAFFALITZKY DE MUCKADELL, M. **Experiments on development in *Fagus silvatica* by means of herbaceous grafting.** *Physiol. Plant., Copenhagen* 9 (3), 1956 (396–400). 4 refs.

Leaf-shedding tips from 5- to 6-year-old Beech clearly showing the juvenile characteristic of retaining withered leaves, were used as scions in spring 1953 (*a*) with basal parts as woody scions grafted on to seedling root-stocks, and (*b*) using a herbaceous technique (fully described) to graft shoot tips on to an old stock. In both cases grafts surviving in December had retained their leaves. It would therefore seem that transition in Beeches from the juvenile stage (where shoots retain withered leaves) is first manifest in meristems and buds which later develop shoots that shed their leaves. [Cf. *F.A.* 16 No. 2672.]

181.9. Miscellaneous. (Including the Ecological Rôle after Death of Plants or Parts of Plants, e.g. Dead Trees, Stumps, Fallen Logs)

See No. 225.

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 21, 95, 269.

237. GODWIN, H. **The history of the British flora: a factual basis for phytogeography.** University Press, Cambridge. 1956. pp. viii + 384 + 1 tbl., 34 plates. 11 pp. of refs. Price £4. 10*s*.

Includes the following sections: collection and identification of plant remains; the background scale of Quaternary change; recorded sites; the plant record (pp. 69–292); and pattern of change in the British flora.

238. CAMPO[-DUPLAN], M. VAN. Diagrammes polliniques théoriques: une interprétation de quelques phases paléosylvatiques des plaines françaises. **[Theoretical pollen diagrams; an interpretation of some phases of forest pre-history in the French plains.]** *Trav. Lab. for. Toulouse* 1 (5), Art. 20, 1955. pp. 6. 3 pp. of refs. [F.]

239. WALDÉN, H. W.; PETTERSSON, E.; FRIES, M.; HALDEN, B. E. **[The past and present distribution of *Corylus avellana* in Sweden.]** *Svensk bot. Tidskr.* 50 (1), 1956 (191–216). 76 refs. [Sw.] O.B.D.

These 4 papers give examples of Hazel found at its northern limit in Sweden and discuss the local climatic conditions. They also discuss changes in climate that have caused changes in its distribution as compared with that shown by fossils. The paper by Pettersson (pp. 197–210) includes a map, citing the authorities, for past and present distribution.

240. POTZGER, J. E., and COURTEMANCHE, A. **Permafrost and some characteristics of bogs and vegetation of northern Quebec.** *Bulletin du Service de Biogéographie, Montréal* No. 14, 1955. pp. 6. 7 refs.

Describes a survey, using an aeroplane to select bogs for pollen analysis near to lakes suitable for landing, and making borings immediately. In anticipation of permafrost problems, a special apparatus was devised for boring through frozen layers of peat. In fact, no permafrost was encountered in bogs or organic desposits below latitude 58° 11′ N. North of lat 50°, the tallest woody plants are Willows and dwarf Birches (*Betula glandulosa* and *B. minor*). Abundant fire scars were found in forested areas far removed from human activity. [Cf. *F.A.* 16 No. 1535.]

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 257, 260, 262, 265–7, 761.

241. SPURR, S. H. **Forest associations in the Harvard Forest.** *Ecol. Monogr.* 26 (3), 1956 (245–62). 31 refs.

A study of records, stand maps etc. from 1902 to 1947, provides an opportunity of evaluating the influence of site and successional developments on the composition of forest associations in this experimental forest, which are analysed in some detail. [Cf. *F.A.* 14 No. 1073.]

242. BUELL, M. F. **Spruce/Fir, Maple/Basswood competition in Itasca Park, Minnesota.** *Ecology* 37 (3), 1956 (606). 2 refs.

Observations made in 1955 on 'islands' of *Picea glauca* and *Abies balsamea* which had been studied in 1945 amongst *Acer saccharum/Tilia americana* forests, showed that their vigour had declined during the decade and they were apparently dying out. The two forest types have sharp limits and neither is apparently now able to invade the other. [Cf. *F.A.* 8 No. 943.]

243. BRAY, J. R. **Gap phase replacement in a Maple/Basswood forest.** *Ecology* 37 (3), 1956 (598–600). 5 refs.

An ecological survey was made of a mixed hardwood stand in Minnesota in which there was a mosaic of patches containing varying proportions and densities of seedlings and saplings, which indicated that the forest canopy was being replaced in a gap-phase pattern as outlined by A. S. Watt [see *F.A.* 9

No. 2101]. Except in canopy gaps, there were more seedlings of *Quercus borealis* and *Carya cordiformis* than of *Acer saccharum*. The ability of *A. saccharum* to take advantage of canopy openings and to remain the dominant member of the forest seems to be dependent on its abundant seed production and the ability of its seedlings to grow rapidly in gaps and overtop the already present Oak and Hickory seedlings.

182.4. Layer Communities

244. ROWE, J. S. **Uses of undergrowth species in forestry.** *Ecology* 37 (3), 1956 (461–73). 16 refs.

No system of describing stands in general terms has hitherto been available for the southern boreal forest of Manitoba and Saskatchewan. A simple scheme based on the physiognomy of the undergrowth and on moistness of site is outlined. As an aid to stand description, a vegetation table is presented, showing the positions of about 200 common forest [shrub and herbaceous] species relative to one another so far as their heights and their moisture preferences are concerned. For field use, a sheet has been drawn up in the form of this table, and the species occurring in plots or stands under study are checked off on it. The resulting scatter pattern provides a basis for the interpretation of site moistness, successional status of the community, density of canopy, and so forth. Some of the commoner forest communities in the southern boreal forest of Manitoba-Saskatchewan are briefly described, using the moisture-physiognomy scheme, and mention is made of some of the prominent species.

The possibility of using the groupings of species in the five moisture series, as shown in the vegetation table, for the interpretation of moistness of site is examined, and a method of working out a Vegetation Moisture Index is proposed. This index is compared with moisture estimates derived from the study of soils and topography, and a good correspondence is shown. It is finally suggested that the method used in working out an index of moistness from the plant species present on a particular site could also be used to derive indices of soil fertility and ecoclimate for use in stand description and in forestry research. *From author's summary.*

245. MOWSZOWICZ, J. Roślinność dolnych warstw borów sosnowych na pogorzeliskach. **[Ground-storey vegetation of Pine forests on burns.]** *Sylwan* 100*A* (3), 1956 (42–9). 9 refs. [Pol.russ.g.]

Forest fires are very destructive to the layer of fungi, lichens and mosses in Pine stands. *Clitocybe laccata* is very frequent on burns. On dry burns the *Ceratodon* synusia occurs, on moister ones the *Fusarium* synusia, and on moist or wet burns in *Pinetum myrtilloso-polytrichosum* the *Marchantia* synusia. From 5 to 10 years after fire, the transient mosses are displaced by species of *Polytrichum*, *Hylocomium*, *Dicranum* etc. *Cladonia*, *Cetraria*, and other lichens appear on dry, sandy burns. Flowering plants are represented by *Epilobrium angustifolium*, *Calamagrostis epigeios*, *Deschampsia flexuosa*; the most frequent tree species are *Pinus sylvestris*, *Betula alba* s.l., and *Populus tremula*.

246. PARKER-RHODES, A. F. **Distribution of fungi in a small wood.** *Ann. Bot., Lond.* 20 (78), 1956 (251–64). O.R.E.

Records of occurrence of ca. 400 Basidiomycete spp. in 32 acres of woodland (Oak, Ash, and Elm in varying proportions) indicated a significant lack of uniformity, most of the species not found in all parts of the wood occurring in the older half. This phenomenon is attributed less to ecological factors than to slow rates of dispersal, puzzling in view of the aerial methods of spore dissemination common to all the species, and needs further research.

182.5. Synecological Measurements and Methods

See also Nos. 743, 783.

247. COTTAM, G., and CURTIS, J. T. **The use of distance measures in phytosociological sampling.** *Ecology* 37 (3), 1956 (451–60). 18 refs.

Four paired-tree or distance methods of sampling [cf. *F.A.* 11 No. 900] were tested on 3 mapped stands and an artificial population and the derived data compared with results obtained by the quadrant method and with the known population parameters. It was found that all the distance methods were capable of yielding accurate results when an adequate sample was used, but that the size of an adequate sample varied with the method. The four methods tested were (*a*) closest individual, (*b*) nearest neighbour, (*c*) random pairs, and (*d*) point-centred quarters. Of these, (*a*) has the advantage of simplicity (only one tree and one distance are measured at each point) but the disadvantage of requiring the sampling of many points in order to obtain an adequate sample. Method (*b*) gives less variable results than (*a*) but still requires a larger number of sampling points than either of the other methods. It too is simple, requiring only the location of the tree nearest the sampling point, and the measurement of the distance from that tree to its nearest neighbour. The random-pairs method with a 180° angle of exclusion (*c*) is less variable than (*a*) or (*b*) and has been more widely used; a disadvantage is that the mathematical theory behind the method has not been worked out. Method (*d*) gives the least variable results for distance determination, provides more data on tree species per sampling point, and is least susceptible to subjective bias. The mathematical characteristics are known. It requires no correction factor, the mean of the distances equalling the square root of the mean area. The apparent disadvantage of requiring more time per point is compensated for by the fewer sampling points needed. In view of these advantages, the authors recommend the use of method (*d*). In this method, each sampling point is considered as the centre of 4 quadrants of a circle, with orientation given by the compass line of traverse. At each point, the closest tree to the point in each of the 4 quadrants round the point is chosen as the sample. Distances are measured from the point to each of the 4 trees, and their species and basal area recorded.

248. LAMPRECHT, H. Über Profilaufnahmen im Tropenwald. **[Stand profile recording in tropical forests.]** [*Docum.*] *12th Congr. int. Union For. Res.*

Organ., Oxford 1956 No. *IUFRO* 56/23/5, 1956. pp. 6 + 3 dgms. 4 refs. [G.g.]

Stresses the importance of comparability e.g. as to size of strip or individual trees included, and describes the author's own system as a basis for standardization. [Cf. *F.A.* 17 No. 251.]

187. Vegetation Types

See also Nos. 141, 240–4, 843, 1172, 1174, 1201.

249. NOIRFALISE, A. La hêtraie ardennaise. **[The Beech forests of the Ardennes.]** *Bull. Inst. agron. Gembloux* 24 (2), 1956 (208–39 + 2 tbls). 31 refs. [F.] E.M.B.

An ecological study of the different types of Beech forest in the Ardennes, falling under the *Luzulo-Fagetum* and the *Quercetum sessiliflorae-Betuletum*, with preliminary notes on climate, geology, soils, effects of human interference and the distribution of Beech forest in this region. [Cf. *F.A.* 12 No. 153.]

250. SCAMONI, A. Neue Erkenntnisse der forstlichen Vegetationskunde. **[New findings in forest ecology.]** *Arch. Forstw.* 4 (5/6), 1955 (501–10). 24 refs. [G.]

Discusses theoretically the classification of forest vegetation in connexion with the recognition of the biogeocoenosis or biochore [units influenced by similar environments], quoting 11 German forest types in relation to the amount and quality of groundwater; the natural distribution of Scots Pine and its unnatural extension in Central Germany, with practical conclusions deprecating its mixture with Beech on some sites and advocating a smaller % on others. Finally, describes the structure of semi-natural stands of the Heiligen Hallen in Mecklenburg to show the two peak distributions of diameter and height and the distribution by pockets and groups of large and small trees (with profile diagram) of a mixed and uneven-aged forest.

251. RUBNER, K. Die Roterlengesellschaft der oberbayerischen Grundmoräne. **[The Alder community of the ground moraine in Upper Bavaria.]** *Forstarchiv* 25 (6), 1954 (137–42). 2 refs. [G.g.]

On the basis of a survey of 279 plots in 1952, a new type, the *Piceeto-Alnetum glutinosae*, is recognized and described.

252. CAMPELL, E. *et al.* Ertragsreiche Nadelwaldgesellschaften im Gebiete der schweizerischen Alpen unter besonderer Berücksichtigung Graubündens. **[High-yielding conifer forest communities in the Swiss Alps, particularly in Grisons.]** *Suppl.* No. 5 to *Bündnerwald, Chur.* 1955. pp. 104 + 7 coloured plates. [G.]

Includes copiously illustrated descriptions of various forest communities, e.g. the *Rhodoreto-Vaccinietum, Piceetum subalpinum* and *alpinum, Abietetum albae* and *isothecietosum* with information on climate, soil, regeneration and management.

253. FERRAI, S. I boschi degli altopiani trentini (Folgaria, Lavarone, Vezzena). **[The woodlands of the plateaux of the Trentino (Folgaria, Lavarone, Vezzena).]** *Monti e Boschi* 7 (8), 1956 (361–7). [It.]

Describes the forest types and advocates silvicultural measures to favour Beech.

254. MATUSZKIEWICZ, W., and MATUSZKIEWICZ, A. Pflanzensoziologische Untersuchungen im Forstrevier 'Ruda' bei Puławy (Polen). **[Study of plant communities in the forest district of Ruda near Puławy (Poland).]** *Acta Soc. Bot. Polon.* 25 (2), 1956 (331–400 + 1 map). 20 refs. [G.pol.] O.B.D.

255. WALTER, H. Vegetationsgliederung Anatoliens. **[The classification of vegetation in Anatolia.]** *Flora, Jena* 143 (2), 1956 (295–326). 15 refs. [G.g.] O.B.D.

Data are presented on the range of the more important forest species of Anatolia, viz. *Fagus orientalis, Abies* spp., *Pinus brutia, P. nigra* var. *caramanica, P. sylvestris, Picea orientalis, Liquidambar orientalis* and *Quercus macrolepis*. Apart from the steppe, 7 forest communities can be distinguished: (1) Central European-Colchian Beech/Fir region, (2) Mediterranean-Aegean region, (3) Mediterranean-S. Anatolian region, (4) Cedar/Fir region of the central Taurus, including the humid Mt. Amanus, (5) Submediterraean *Pinus nigra* var. *caramanica* region, (6) Boreal Spruce/Pine region, and (7) E. Anatolian Oak/*Juniperus excelsa* region. Some examples from N. Anatolia illustrate the complexity of the altitudinal vegetation zones in individual mountains. These are conditioned not only by temperature but also by precipitation.

256. MOHAN, N. P., PURI, G. S., and GUPTA, A. C. **The Himalayan conifers. IV. The study of soil profiles under some forest communities in the Bashahr Himalayas.** *Indian For.* 82 (6), 1956 (295–307). 3 refs.

[Cf. *F.A.* 17 No. 1406.] Describes soil profiles under the climax communities *Quercus semecarpifolia* and *Q. ilex*, and the Oak/conifer, mixed conifer and pure conifer (largely seral) communities occurring in the same area, with tabulated data on moisture, organic matter, exchangeable Ca, pH and N content, and notes on some interrelationships.

257. MOHAN, N. P., and PURI, G. S. **The Himalayan conifers. V. The succession of forest communities in Chir Pine (*Pinus roxburghii*) forests of the Punjab and Himachal Pradesh.** *Indian For.* 82 (7), 1956 (356–64 + 1 dgm.) 8 refs.

[Cf. *F.A.* 17 No. 1406.] Forest communities in the Chir Pine forests of the Punjab and Himachal Pradesh have been studied, the 6 types are described briefly, and the trend of succession discussed in some detail. The succession proceeds as follows: (1) on sand rock substratum, Chir Pine to Chir Pine/*Terminalia chebula* with an undergrowth mainly of *Carissa spinarum*; (2) on deep alluvium, Chir Pine to Chir Pine/mixed broadleaved species; (3) on Himalayan schistose rocks, Chir Pine to *Quercus incana*/*Rhododendron arboreum*/*Pieris ovalifolia*; (4) ferruginous clayey substratum, Chir Pine with *Carissa* and/or *Dodonaea* to mixed Chir Pine/broadleaved species. Soil profiles from the 6 types have also been studied and the data are presented in tabular form. *From authors' summary.*

258. SUZUKI, T. **The forest climaxes of East Asia [Formosa and Japan].** *Japanese Journal of Botany, Tokyo* 14 (1), 1953 (1–12). 38 refs. [E.] C.G.B.

Lists and describes 28 associations (subtropical and warm-temperate broadleaved evergreen, temperate coniferous, and cool-temperate deciduous) and discusses the relation between the associations and environmental conditions, and their distribution in relation to the monsoon. Concludes that the main physiographic types are (1) the *Shiia*-type (temperate and subtropical rain forest, endemic in Asia); (2) the *Tsuga*-type (temperate coniferous, also in montane N. America); (3) the *Fagus*-type (cool-temperate deciduous, common to the northern hemisphere).

259. MATSUI, Z. **[The ecological features in foggy district [eastern coastal Hokkaido].]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (103–23). 4 refs. [Jap.e.]

Includes notes on the effects of the dense sea fogs on the vegetation, tree form and land use, with particular reference to Todo [*Abies mayriana*] and Akaezo [*Picea glehnii*]. Stand tables compare the diameter distribution in Todo/hardwoods inside and outside the fog-bound area, and the bole forms of both species in both areas are graphically compared. Ground-cover species lists for the Fir and the Spruce forests illustrate Raunkiær's law [cf. *F.A.* 17 No. 2617]. Measurements for naturally layered Akaezo are tabulated and local variations of habit, morphology, timber and bark volume of the Fir are detailed.

260. HEWETSON, C. E. **A discussion on the 'climax' concept in relation to the tropical rain and deciduous forest.** *Emp. For. Rev.* 35 (3), 1956 (274–91). 16 refs.

Based on the author's own observations in Central India and a review of the literature, the thesis is put forward that tropical forests do not constitute a stable climax community but a continuum whose parts are in unstable equilibrium.

261. **[Map of] Vegetation of the Anglo-Egyptian Sudan.** Sudan Survey Department, Khartoum. 1954. 1 sheet. Scale 1 : 4,000,000.

262. SILVA, H. LAINS E. Capinzais secundários de Angola. **[Secondary grasslands of Angola.]** *Garcia de Orta, Lisboa* 4 (1), 1956 (49–55 + 3 plates). 17 refs. [Port.e.]

Discusses the status of the grasslands of Angola, apparently not a climax, but probably the result of burning and shifting cultivation. This theory is supported by the fact that the transition from high forest to grassland is sudden. Brief notes are presented on shifting cultivation practices and their effects.

263. Mesas redondas sobre problemas de las zonas áridas de México—Biblioteca Central de la Ciudad Universitaria 24 a 28 enero de 1955. **[Conference on problems of the arid zones of Mexico—held in the central library of the University, 24th–28th January, 1955.]** Instituto Mexicano de Recursos Naturales Renovables, Mexico, D.F. 1955. pp. VI + 262 + 1 dgm., 1 gph., 2 maps. Many refs. [Span.]

Contains the following papers: Definition of the arid zones and their demarcation in Mexico (*A. Contreras Arias*); Hydrology of the arid zones of Mexico (*A. García Quintero*); Ecology of the arid zones of Mexico (*F. Miranda*); Investigations and work in the arid zones of Mexico (*M. González Cosío*); Problems of the industrialization of products from the arid zones of Mexico (*R. Hernández Corzo*); and Mexico and its arid zones: problems and perspectives (*E. Beltrán*).

264. **Report of the ecologist.** *Rep. Dep. Agric. Nyasald. 1954/55* No. 2, 1956 (49–57). 1 ref.

Covers land use, vegetation and soils of the Fort Johnston and Alimenda districts and the Vipya plateau, giving for the last the grasses indicating suitable sites for Pines.

265. RITCHIE, J. C. **The vegetation of Northern Manitoba. Studies in the southern Spruce forest zone.** *Canad. J. Bot.* 34 (4), 1956 (523–61 + 6 photos). 56 refs. O.R.S.

A brief account is given of topography, geology and climate, and the communities in the two areas of study are described. The predominant and stable forest of mesic sites is dominated by *Picea mariana* with a ground vegetation of weft-form mosses. *Pinus banksiana* is a seral dominant here and also dominates various forests on outcrop ridges, sand planes and eskers. *Picea glauca* is rarely found, occurring only on sites that exceptionally favour it. A description is given of an extremely local community of *Betula papyrifera* var. *neoalaskana* on ridges having some organic matter—never before recorded for North America. *From author's summary.*

266. WARD, R. T. **The Beech forests of Wisconsin—changes in forest composition and the nature of the Beech border.** *Ecology* 37 (3), 1956 (407–19). 59 refs.

Investigations of old records and comparison with present forests, show that *Fagus grandifolia* has been decreasing and *Acer saccharum* increasing in these forests during the past 100 years, probably as a result of a long-term successional trend. The N.W. limit of Beech seems to be correlated with low temperatures and short growing season, and the S.W. limit with available moisture.

267. FERRI, M. GUIMARÃES. Contribuição ao conhecimento da ecologia do cerrado e da caatinga. Estudio comparativo da economia d'agua de sua vegetação. **[The ecology of the *campo cerrado* and the *caatinga*. A comparative study of the water economy of the vegetation.]** *Boletim, Faculdade de Filosofia, Ciências e Letras, Universidade de São Paulo* No. 195, 1955. pp. 170. 150 refs. [Port.e.]

The study was made in (1) the *campo cerrado* of Emas near Pirassununga and (2) the *caatinga* of Paulo Afonso, State of Bahia. Data are presented on the temperature and water régime of both areas,

and the species occurring most frequently in both vegetation types are listed. Measurements of transpiration rates were made on several representative species, and curves plotted showing the daily course of transpiration and evaporation. Stomatal reactions and the anatomical structure of the leaves were also studied. The *caatinga* has much more arid conditions than the *campo cerrado*. The behaviour of the plants suggests that species native to the *caatinga* would adapt themselves well to the *campo cerrado*. The *caatinga* of Paulo Afonso is a climax, whereas the *campo cerrado* of Emas is not. This suggests that reforestation and agriculture are possible in the *campo cerrado*, even without irrigation. In the *caatinga* reforestation can succeed only with species having a very low water consumption. *From author's summary.*

268. BRAUN, O. Clasificación de los bosques de Bolivia. [**Classification of the forests of Bolivia.**] *Bol. for. Serv. for. Bolivia* No. 1, 1956 (73–8). [Span.]

Defines the area and presents short descriptions of the following forest types: cloud forest, xerophytic forest, montane rain forest, tropical rain forest, savanna, deciduous forest and *páramo*.

269. MARCUZZI, G. Contribución al estudio de la ecologia del medio xerófilo venezolano. Región de Lagunillas en el estado Mérida. [**The ecology of the xeric region of Venezuela. Lagunillas in the state of Mérida.**] *Bol. Ingen. For. Univ. Los Andes* 3 (11), 1956 (8–42). 33 refs. [Span.]

A study of the ecology, geography, palaeogeography and geology of the area tends to confirm the thesis that the region now forming part of the Andes of Mérida is of relatively recent origin, and up to the Pliocene and Pleistocene periods was a littoral zone, the characters of which, favoured by the dry climate and the nature of the soil, have persisted until to-day.

270. [**Composition, ecology and silviculture of peat-swamp forests.**] *Rep. For. Dep. Sarawak 1955*, 1956 (17–8).

The following conclusions are drawn: (1) Each species has its own range, but 3 species—*Gonystylus bancanus*, *Dactylocladus stenostachys*, and *Pseudosindora palustris*—occur throughout the swamps. Drainage appears to be the chief limiting factor. (2) The principal recognizable forest types are: (*a*) mixed swamp forest, coastal or deltaic; (*b*) *Alan* swamp forest dominated by heavy-wooded *Shorea albida*, with the lower storeys usually comprising mixed-swamp-forest species; (*c*) *Alan bunga* forest carrying dense crops of light-wooded *S. albida* and few other species; and (*d*) *Padang paya*, usually carrying a dense stand of tall, slender trees dominated by a single species, but at its extreme limit consisting of raised sphagnum bog, with scattered, stunted trees. (3) Virgin mixed swamp forest averages about 75 tree species (12 in. girth and over) per acre, but this decreases to about 25 in the middle of the swamps. In each forest type, size of trees tends to decrease towards the middle of the swamp. (4) In (*a*) natural regeneration is usually adequate to replace old trees. *S. albida* fruits at long and irregular intervals and its seedlings do not survive well in shade; in (*b*) its regeneration cannot usually compete with invading mixed-swamp-forest species, but in (*c*) competition is usually less severe. In (*d*) regeneration is almost entirely vegetative, but vegetative reproduction of *G. bancanus* has not been observed.

271. PAPY, H. R. Tahiti et les îles voisines: la végétation des îles de la Société et de Makatéa (Océanie française). [**Tahiti and the neighbouring islands: the vegetation of the Society Islands and Makatea (French Oceania). [Vols. 1 and 2].**] *Trav. Lab. for. Toulouse* 5, Sect. 2 (1), Art. 3 [1955] (1–386 + 56 plates). 18 pp. of refs. [F.] [Cf. *F.A.* 16 No. 324.]

2. SILVICULTURE

See also Nos. 161–3, 253, 772, 1169, 1171, 1217.

272. HOUTZAGERS, G. Houtteelt der gematigde luchtstreek. Deel II. Het bos. [**Timber-growing in the temperate zone. Part II. The forest.**] N.V. Uitg.-Mij W. E. J. Tjeenk Willink, Zwolle. 1956. pp. iv + 438 + 1 photo., 6 maps. 328 refs. [Du.] Price *Fl.*41.

Part II [for part I see *F.A.* 16 No. 1572] contains sections on: [world] forest regions; forest ecology (climatic and edaphic factors, topography and biotic site factors); biology of forest trees (including information on age at first flowering and fruiting of trees commonly grown in the Netherlands, methods of inducing premature flowering, collecting and storing seed, germination, vegetative propagation, and maturity of various species); establishment of forests (natural and artificial regeneration, forest nurseries, cultivation, choice of species, use of mixtures, planting methods etc.); tending (cleaning, thinning systems and grades, pruning); silvicultural systems; forest types and distribution in N. America and Europe; and the forests of the Netherlands, including information on education and research, and forest statistics. There are many photographs, tables, maps and other illustrations.

273. KÖSTLER, J. [Translated by ANDERSON, M. L.] **Silviculture.** Oliver and Boyd, Edinburgh. 1956. pp. xvi + 416 + 20 plates. Many refs. Price £2. 5*s*. Translation of *Waldbau*, published 1950. [See *F.A.* 12 No. 1038.]

274. SOWERS, D. W., *et al.* **Some factors affecting management of conifers and hardwoods in the Allegheny region.** *J. For.* 54 (9), 1956 (563–7).

Discusses climate and location, seedling establishment, seedling growth, stocking, harvesting and regeneration of the 4 forest types: Virginia Pine/Southern Red Oak, Shortleaf Pine/Oak, White Pine/

Northern Red Oak/White Ash, and Beech/Sugar Maple.

275. KRAUCH, H. **Management of Douglas Fir timberland in the southwest.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 21, 1956. pp. 59. 46 refs.

Summarizes data from studies carried out in Arizona and New Mexico on distribution, composition, factors affecting natural regeneration of Douglas Fir and associated species, artificial regeneration, and productive capacity, and makes recommendations for silvicultural treatment.

276. BEDNALL, B. H. **Silviculture in relation to management of *Pinus radiata* in South Australia.** *Aust. For.* 20 (1), 1956 (30–6 + 5 photos).

Discusses current practice in relation to site preparation, initial spacing, pruning and thinning.

277. BARNARD, R. C. **[A manual of Malayan silviculture for inland lowland forests.] Index and addenda and corrigenda.** *Res. Pamphl. For. Res. Inst., Kepong* No. 14 (supplement), 1956. pp. 9 + 2. [Cf. *F.A.* 16 No. 3929.]

278. KRISHNASWAMY, V. S. **Bamboos—their silviculture and management.** *Indian For.* 82 (6), 1956 (308–13).

Deals principally with *Dendrocalamus strictus.*

279. PHILIPPIS, A. DE. Le problème du châtaignier en Italie. **[The Chestnut problem in Italy.]** *Schweiz. Z. Forstw.* 107 (7), 1956 (377–92 + 2 tbls.) 9 refs. [F.g.]

Surveys reasons for the decline of high Chestnut forests and suggests as possible solutions conversion to coppice (e.g. Oak) or high forest of other species (e.g. Pines), or agricultural/horticultural use. A cautious approach is advocated, particularly in view of the risk of erosion.

280. GRANDI, C. La coltura del pioppo nel cantone Ticino. **[Poplar growing in the Ticino.]** *Schweiz. Z. Forstw.* 107 (8/9), 1956 (472–80). [It.g.]

Discusses recent developments, including trial plantings with stock from Yverdon, Casale Monferrato, and local clones, of which some from Yverdon showed greatest promise, and describes nursery and planting techniques. A spacing of 7 × 8 m. is favoured except for pulpwood plantations, or where thinning can be combined with the cutting of a coppice understorey. Caution in pruning and cutting back is enjoined.

281. PODHORSKI, I. Razvoj uzgoja topola u NRH. **[Development of Poplar cultivation in Croatia.]** *Šum. List* 79 (11/12), 1955 (396–411). [Croat.f.]

Survey of work done in this field, particularly during the last 10 years.

282. MATSUI, Z. **[Silvicultural studies of Doro-Poplar [*Populus maximowiczii*] in Hokkaido.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (665–714 + 10 photos). 15 refs. [Jap.e.]

Includes growth data for plantation-grown crops on 4 sites at 30 years, showing m.a.i.'s from 4·2 to 8·7 cu.m./ha. Underplanting with *Abies* sp. after thinning (B or C grade) or a mixture with Alder are recommended. Cuttings (20–50 cm. long) planted on weeded land give a 90–95% stocking with 1st- and 2nd-year height growths up to 22 and 88 cm. respectively. Rats and hares require extermination; insect pests are named.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 698–9, 776, 786–7.

283. HOFMANN, A. L'utilizzazione delle faggete nel Meridione. **[The exploitation of Beech woods in the south of Italy.]** *Ital. for. mont.* 11 (2), 1956 (69–90). 12 refs. [It.it.f.]

Gives an account of the history and extent of the Beech woods of the southern Apennines (171,000 ha. of high forest and 116,000 ha. of coppice with standards), the method of exploiting the former (progressive regeneration fellings), and possible ways of converting the coppice to high forest.

284. ALEXANDER, R. R. **A comparison of growth and mortality following cutting in old-growth mountain Spruce-Fir [*Picea engelmannii*/*Abies lasiocarpa*] stands.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 20, 1956. pp. 4.

Results of a study started in 1944 on four 8-acre plots showed no evidence that growth of the residual stand was stimulated by felling by alternate clear-strip, group selection or single-tree selection methods. Causes and amounts of mortality on the different plots, and methods of reducing windfall and their respective merits, are discussed.

285. RAU, W. Weiterentwicklung des Wagnerischen Blendersaumschlagbetriebs in den letzten zwei Jahrzehnten. **[Wagner's *Blendersaumschlagbetrieb* [strip system] in the last two decades.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (917–8). [G.]

A note by the ex-Forstmeister of Gaildorf on the effects on the system of excessive war and post-war fellings, the 1947–49 drought, and record outbreak of barkbeetles, and the westerly gale (up to force 12) of January 1955. [Cf. *F.A* 14 No. 3234.]

286. RUDOLPH, V. J., and ARNOLD, C. I. **The Fred Russ forest cuttings—a progress report.** *Quart. Bull. Mich. agric. Exp. Sta.* 38 (4), 1956 (644–63). 4 refs.

A preliminary report on a long-term project to determine the comparative effects on regeneration, stand composition etc. of different types of selective logging in mixed hardwood stands in Michigan.

222. Coppice, Pollarding and Lopping Systems

See No. 283.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 283, 298, 440.

287. VANSELOW, K. Umwandlung hiebsreifer Fichten-(Kiefern-)Bestände in Mischbestände. Ein

Versuch. **[Conversion of mature Spruce (/Pine) stands into mixed stands. An experiment.]** *Allg. Forst- u. Jagdztg.* 125 (2), 1953 (58–61). [G.e.]

In Spruce stands, partly mixed with Pine and Beech, in the S. Bavarian hills, where previous methods of gradually achieving more balanced mixtures had been unsatisfactory, excellent mixed regeneration was achieved by gradual opening of the canopy to about ½ the original density over 4 years, soil preparation in strips, sowing (and planting) Oak, Beech and Larch, and fencing. Spruce and Pine regenerated freely. Unfenced controls failed. *From author's summary.*

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 205, 213–4, 244, 248, 250, 415, 743, 753, 775, 1201.

288. Köstler, J. N. Bildliche Darstellung des Bestandesgefüges. **[Graphical representation of stand structure.]** *Allg. Forst- u. Jagdztg.* 125 (2), 1953 (69–76). 26 refs. [G.e.]

The author deals with the different needs in different types of stand (e.g. thickets vs. mature mixed stands) and discusses, chiefly from the literature (including his own works) various types of representation, diagrams, profiles etc., suitable for each.

289. Köstler, J. N. Zur Frage der Strukturanalyse von Beständen. **[The analysis of stand structure.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/4, 1956. pp. 3 + 4 dgms. 5 refs. [G.g.e.f.]

Stresses the need for different methods of analysis at different stages of development (young reproduction, thicket, pole stage, mature, and old stands) and gives some examples of diagrammatic plans and profiles for different stages.

290. Popert, H. **The place of broadleaved trees in British forestry.** *Quart. J. For.* 50 (3), 1956 (181–9).

Discuses the relative merits of conifers and broadleaved trees for planting in Britain, and reviews some of the relevant economic and amenity factors involved in the choice.

291. Wirth, F. Wandel der Waldbestockung im Frankenwald. **[Changes in the distribution of species in the Frankenwald.]** *Mitt. StForstverw. Bayerns* No. 28, 1956 (179–205). 28 refs. [G.]

Traces the changes from the original mixed Silver Fir/Spruce/Beech forest, via a preponderance of Fir, to the present 'usurpation' of the district by Spruce and the silvicultural practices responsible for the change, and advocates a return to the original stocking.

292. Galoux, A. Le choix de l'essence en sylviculture. **[The choice of species in forestry.]** *Bull. Soc. for. Belg.* 63 (6), 1956 (241–72). 3 refs. [F.]

Discusses the general ecological and economic factors involved, tabulates species recommended for the principal regions and soils of Belgium, and gives a specimen of an ecological and soil map of an actual forest as a basis for choice of species [cf. *F.A.* 16 No. 3282].

293. **Crown classification of natural forest trees.** *Tech. Note For. Dep. Uganda* No. 17/56, 1956. pp. 2.

A refinement to 5 categories of the 3-point classification of the Indian Silvicultural Research Code, Vol. 3, p. 224 (Griffith and Prasad) for crown position, with guiding principles for a 5-point classification of crown form, for use in high forest.

294. Olberg, A. Ein neuer Vorschlag für ein Baumklassensystem. **[New proposals for a system of tree classes.]** *Allg. Forst- u. Jagdztg.* 126 (4), 1955 (65–7). 4 refs. [G.g.e.]

The author has revised his classification [see *F.A.* 16 No. 1585] by substituting for his main criterion (height expressed as % of mean height of dominants) a new division into 6 classes defined by the relative position of crowns in space: above main-storey height, main storey, transitional, intermediate, understorey, and ground storey. Maintaining his numerical coding, he now allocates the second place to an indication of competition, which includes, in 6 classes, both overtopping and lateral crowding, and their likely effect on development; 3rd and 4th places characterize, in 5 classes, length and cross-section of crown respectively.

295. Leibundgut, H. Beispiel einer Bestandesanalyse nach neuen Baumklassen. **[Example of a stand analysis with new tree classes.]** [*Docum.*] *12th Congr. Int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/23/13, 1956. pp. 5 + 13 tbls. 4 refs. [G.f.]

Tabulates the results of testing the author's tree-class system on 5 trial plots 1740–2853 sq.m. in size, of 40- to 50-year-old broadleaved coppice with a few standards, distinguished chiefly by the degree of thinning carried out, and concludes that it gives a very good picture of the structure of these stands, whose differences are small, and allows statistically significant mean values to be derived to which mathematical methods can be applied. [Cf. *F.A.* 18 No. 415.]

23. Regeneration and Formation of Stands

See also Nos. 180, 216 *et seq.*, 1201–2.

296. Saw Tun Aung, U. **Regeneration of Teak in Burma.** *Burmese For.* 5 (2), 1955 [1956] (100–7).

A reply to criticisms of the author's views on Teak plantations by C. W. D. Kermode. [Cf. *F.A.* 16 No. 2832.]

231. Natural Regeneration

See also Nos. 27, 177, 225–7, 406, 534–5, 699–700, 772.

297. Rodger, G. J. **The case for and against the use of natural regeneration in re-establishing softwood plantations in Australia.** *Aust. For.* 20 (1), 1956 (18–25). 6 refs.

With particular reference to *Pinus radiata*; sets out arguments on both sides, without coming to any general conclusion.

298. MARION, J. La régénération naturelle du cèdre dans les cédraies du rebord septentrional du moyen-Atlas occidental calcaire. [**The natural regeneration of Cedar in the Cedar forests of the limestone area of the northern borders of the West Central Atlas.**] *Ann. Rech. for. Maroc 1953–1955* No. 1, 1955 (31–149 + 16 photos, 2 dgms.) 53 refs. [F.f.e.span.]

This detailed study, having applications for ca. 65,000 ha. of the *Cedrus atlantica/Quercus ilex* type, covers the site factors [cf. *F.A.* 15 No. 175], the past history, and the defects and merits of the 1940 working-plan prescriptions for obtaining regeneration [cf. *F.A.* 8 No. 204]. Conclusions are drawn on the conditions required to obtain Cedar regeneration generally and the particular measures required in four different types of stand. These are incorporated in the author's 'progressive method' for the conversion of the forests in one rotation into uniform high forest. Salient points in the method are the reduction of the overstorey from 100 to 30–40 Cedars/ha. during a regeneration period of several decades, in order to prevent invasion of herbs and consequent competition for water. This opening of the canopy can be done evenly where an Oak underwood provides additional shelter; elsewhere it should be done by groups, the extension of the openings proceeding in a S. or S.E. direction as regeneration is established. Cedar regeneration is thus protected from the mid-day sun. The growing space allotted to seed-trees should be no more than that required for further increment and seed production, and Oak useful for shelter should be retained. Grazing must be excluded for 40–50 years and the conversion rotation raised from 120 to 200 or 250 years.

299. AGRAWAL, S. C., and PATIL, B. D. **Problem of Fir (*Abies pindrow, A. spectabilis*) and Spruce (*Picea morinda*) regeneration.** *Indian For.* 82 (7), 1956 (382–6 + 3 photos). 15 refs.

The absence of adequate natural regeneration in Indian Fir/Spruce forests has drawn the attention of forest officers for a long time. Various factors responsible for the inadequacy of regeneration are discussed. It has also been noted that Fir and Spruce seedlings are shade-demanders in early stages. Reproduction of both occurs plentifully at lower elevations under broadleaved trees. A large number of exotic and indigenous species are under trial as nurse crops, e.g. *Populus monilifera, P. generosa, P. ciliata, Aesculus indica, Prunus padus, Fraxinus excelsior, Thuja plicata, Larix decidua* and *L. leptolepsis, Cupressus torulosa* and *C. obtusa.* The junior author while touring in the U.S.A. observed that *Populus tremuloides* acted as a nurse crop in the regeneration of Spruce. It is suggested that further work on the role of broadleaved associates may be taken up. Aspen seems to be a very promising nurse crop and is worth trial. *From authors' summary.*

300. LOGAN, K. T., and BROWN, W. G. E. **Regeneration of Red and White Pine (*Pinus resinosa* and *P. strobus*) in the Great Lakes—St. Lawrence forest region.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/15, 1956. pp. 9. 4 refs.

Describes the results of a survey of Red and White Pine reproduction in the central portion of this region in Eastern Canada. Regeneration is not generally satisfactory, and the survey was undertaken to determine in what circumstances adequate regeneration may be obtained. The forest site types studied are described. It was found that seed supply and relative vigour of Pine seedlings and competing vegetation were the two main features controlling establishment of Pine regeneration. Examples of these conditions in the various forest site types are described. The importance of seed supply is stressed. Features which discourage competing species, such as drought and severe fire, were found to favour Pine regeneration. For application in Pine management, the forest site types were grouped into four regeneration groups, based on the ease with which Pine could be regenerated. *From authors' summary.*

301. LIVINGSTON, K. W. **Reproduction of Slash Pine outside its natural range.** *J. For.* 54 (8), 1956 (532).

Natural regeneration of *Pinus elliottii* has appeared beside a 24-year-old plantation at Auburn, Alabama. This is ca. 100 miles north of its natural range and 400 ft. higher than its usual altitude. The seedlings, which are scattered along the sides of a roadway, are from 2 to 8 ft. high and appear to be 4–5 years old. The soil is loamy sand.

302. CHURCH, T. W., JR. **Observations following wildfire in a young stand of Virginia Pine and hardwoods.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 49, 1955. pp. 2.

After a forest fire in Nov. 1952, four $\frac{1}{20}$-acre plots were established, three in the burnt area (*a*), one in the unburnt area (*b*). After 2¼ years there were 10,750 Pine seedlings/acre on (*a*) and 250 seedlings/acre on (*b*). Litter on (*a*) was reduced from 2·3 to 1·7 in. and there was also less shade. These factors may explain the large difference.

303. ILMURZYŃSKI, E., and MIERZEJEWSKI, W. Badanie możliwości wykorzystania starszych odnowień podokapowych sosny. [**Possibility of utilization of older [ca. 25-year-old] self-sown Scots Pine stands under the mother canopy.**] *Sylwan* 100*A* (3), 1956 (72–84). 2 refs. [Pol.]

As a result of trial fellings by different logging methods in such stands of Scots Pine under a canopy of trees 120–160 years old (site quality III; varying stand and overwood density) measures to reduce wastage and severe damage to the younger trees are recommended, including tree-length logging. The operation was planned to reduce the understorey to ca. 20% of the original stocking.

304. MARION, J. Méthode employée dans l'étude de la régénération naturelle des forêts marocaines. [**Methods used in the study of natural regeneration in Moroccan forests.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/21/18, 1956. pp. 8. 5 refs. [F.]

Describes the system of permanent plots, quadrats etc., and the combination of written records, maps and photographs, used in the study of natural regeneration of *Quercus suber*.

305. MARION, J. Observations sur la sylviculture du chêne-liège dans le massif forestier Zain-Zemmour ou plateau d'Oulmès (Maroc). **[Silvicultural observations on *Quercus suber* in the Zain-Zemmour forests, Morocco.]** *Ann. Rech. for. Maroc 1953–1955* No. 2, 1955 (1–38). 2 refs. [F.f.e.span.]

As the proportion of stems in the stand with a g.b.h. of 100 cm. rises above 50%, the number of stumps that will coppice falls below 20%. This girth is often attained before 80–90 years, so that, with working-plan rotations of 108 and 120 years, this form of regeneration is excluded. A general good seed-year occurred in 1951–52, the previous one was in 1936, an interval of 15 years, which allows, with regeneration periods of one-quarter of the rotation (27 and 30 years), only two good seed-years per period. These periods must be adjusted to cover more than one seeding and give time to bring on the regeneration derived from the last, so that considerable discretion must be allowed to the local executive. The seed falls vertically and rolls a little downhill. Regeneration is seldom established except under cover of the seed-tree, where its growth remains suppressed. Unless shelter is available from the hot sun, it will not survive the peaks of the first and second summers. The canopy must therefore be closed when seeding fellings begin. These should follow immediately on a good seeding and the canopy must be progressively and gradually opened as seedlings are established. Advance reproduction should be cut back, allowed to coppice, and freed from competing vegetation. The above advice is supported by detailed data from quadrats.

306. BARNARD, R. C. **Recruitment, survival and growth of timber-tree seedlings in natural tropical rain forest.** *Malay. For.* 19 (3), 1956 (156–61).

Describes a study begun in 1947 in a virgin jungle plot in Negri Sembilan, and discusses the technical difficulties involved in the study. Preliminary indications are that the seedling population of economic species in natural forest will rarely fall below a minimum that gives good prospects for successful natural regeneration, but that no development of these seedlings can be expected under closed canopy. Modifications of plot technique are recommended.

307. CLARKE, E. C. **The regeneration of worked-out Greenheart (*Ocotea rodiaei*) forest in British Guiana.** *Emp. For. Rev.* 35 (2), 1956 (173–83). 2 refs.

Describes a pilot project, covering an area of 1 sq. mile, for testing a method of encouraging natural regeneration of *O. rodiaei* by climber cutting, removal of undergrowth, and opening of the canopy. Details are given of man-hours, costs etc. [Cf. *F.A.* 14 No. 1104.]

232. Artificial Regeneration

232.1. Choice and Trial of Species, Races etc.

See also Nos. 174, 176, 292, 394, 397, 401.

308. SCOTT, G. **Reafforestation in Bermuda.** [Department of Agriculture, Bermuda] [1956]. pp. 6. Limited distribution.

Lists, with brief comments, the species of trees and shrubs used to replace *Juniperus bermudiana* killed by the scale insect, *Carulaspis visci*.

309. MASINI, G. Osservazioni sui rimboschimenti dell'Isola d'Elba. **[Notes on afforestation in the Isle of Elba.]** *Monti e Boschi* 7 (6), 1956 (261–70). [It.f.e.]

Many exotic as well as native species have been tested; the most successful were *Pinus pinaster*, *P. nigra* var. *calabrica*, *P. pinea*, *P. radiata*, *P. canariensis*, *Acacia pycnantha*, and *Eucalyptus* sp.

310. BARNER, J. Die Bedeutung der Baummorphologie für die Holzartenwahl in Trockengebieten. **[The significance of tree morphology for the selection of species in dry areas.]** *Allg. Forst- u Jagdztg.* 125 (1), 1953 (19–21). 8 refs. [G.e.]

In the dry area of the Upper Rhine valley, Black Poplar hybrids with straight stems and radial upward-growing branches developed strong taproots and were more drought-resistant than hybrids with branching, spreading crowns, which had a more extensive system of lateral roots near the surface. Soil moisture measurements indicated that rain water tended to run down the stem in the former, creating a central area of maximum moisture round it, while in the latter it dripped from the end of the branches, resulting in a more diffuse peripheral distribution.

311. HARTMANN, F. K., QUERENGÄSSER, F., and JAHN, G. Unterlagen für den Anbau westamerikanischer Nadelholzarten in Deutschland. **[Basic data for the planting of western N. American coniferous species in Germany.]** *Allg. Forst- u. Jagdztg.* 125 (1), 1953 (25–47). 30 refs. [G.]

A collection of data, in tabulated form, based chiefly on American literature, on the natural habitat, climatic and edaphic requirements, growth, hardiness, pests and diseases, wood properties, etc. of *Abies amabilis*, *A. concolor*, *A. grandis*, *A. procera*, *Picea engelmannii*, *P. sitchensis*, *Pinus contorta* var. *latifolia*, *P. monticola*, *P. ponderosa*, *Pseudotsuga taxifolia* var. *viridis*, *Sequoia gigantea*, *Thuja plicata* and *Tsuga heterophylla*, with comments on their prospects in Germany and notes on a further 9 species. [Cf. *F.A.*17 No. 1443].

232.11. Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.

See also Nos. 1164, 1169, 1200, 1202.

312. WHITE, P. J. **Note on the performance of Sitka Spruce on a deep peat.** *Irish For.* 13 (1), 1956 (15–6).

Note on the growth of a small plantation (268 trees) made in 1912 in Co. Clare. Mean height is now 87 ft. and mean q.g.b.h. 11¾ in.

313. SCHOBER, H. Ergebnisse von Anbauversuchen mit ausländischen Holzarten. [**Results of trials of exotics.**] *Ned. Boschb.-Tijdschr.* 28 (8), 1956 (187–202). [G.]

Outlines briefly the results of trials in Germany since about 1880 of a number of species, the most important being Douglas Fir, Sitka Spruce, Japanese Larch and *Quercus borealis*.

314. FABRICIUS, W. Die Bereicherung einheimischer Wälder mit fremdländischen Holzarten. [**Enrichment of German forests with exotics.**] *Allg. Forst- u. Jagdztg.* 125 (3), 1954 (94–101). 3 refs. [G.]

Notes on some 25 species, mostly conifers, based chiefly on experience with the experimental plantings at Weinheim, Baden.

315. ZEIDLER. Erfahrungen im Douglasienanbau. [**Experience with Douglas Fir.**] *Forst- u. Holzw.* 11 (13), 1956 (271–3). [G.]

Deals with pure stands, mixtures, underplantings, conversions etc., on alluvial, chiefly sandy soils in Gadow (lower Elbe valley, E. Germany) where *Pseudotsuga taxifolia* (chiefly var. *viridis*) was introduced in 1865. Stands have been established from local seed, and vegetative propagation is being successfully practised.

316. GREGUSS, P. Egy Kínából származó uj haszonfenyöfa (*Metasequoia glyptostroboides* Hu et Cheng). [**A new coniferous tree of Chinese origin (*M. glyptostroboides*).**] *Erdö* 4 (1), 1955 (8–12). 12 refs. [Hu.]

Raised in Hungary from imported seed, the *Metasequoia* made rapid growth and one-year-old transplants were 2½ m. high in ca. 4 years. Untreated cuttings from side shoots put on 40–45 cm. growth in 9 months. The species has proved to be tolerant of low winter temperatures and is likely to do well in sandstone areas of 35–40 in. annual rainfall.

317. MERENDI, A. Una eccellente conifera esotica, il pino strobo, *Pinus strobus* L. [**An excellent exotic conifer, *Pinus strobus* L.**] *Ital. agric.* 93 (4), 1956 (363–6). [It.] E.M.B.

Gives a general account of the species and its use in Italy especially as a nurse species during the conversion of coppice stands.

318. RUDOLPH, V. J., LEMMIEN, W., and DAY, M. W. **Growth of White Pine [*Pinus strobus*] in some pure and mixed plantings in Michigan.** *Quart. Bull. Mich. agric. Exp. Sta.* 38 (4), 1956 (538–46). 7 refs.

Growth of White Pine was unsatisfactory in mixtures, where it was suppressed by Red and Jack Pine, and survival and growth were both unsatisfactory in pure plantations, which were vulnerable to White Pine weevil and blister rust. Red Pine [*P. resinosa*] is to be preferred for planting in this area.

319. HANSBROUGH, T. **Growth of planted Loblolly and Slash Pines in North Louisiana.** *LSU For. Notes La. agric. Exp. Sta.* No. 10, 1956. pp. 2. 1 ref.

Pinus elliottii, which is here outside its natural range, had significantly lower survival than the native *P. taeda* after 5 years, but comparable height and diameter growth.

320. SHACHORI, A. **The possibility of introducing *Pinus coulteri* to Israel.** *La-Yaaran* 6 (3/4), 1956 (22–4, 31). [Heb.e.]

A comparison of the temperature, rainfall, soil, and soil-water regime in Israel with those of California. Suggests that the danger of the hot dry spells of spring (*Khamseen*) might be obviated by autumn planting. Annual weeds might require elimination. The future growth of this very adaptable species on shallow soils requires investigation. *From author's summary.*

321. MCWILLIAM, J. R., and RICHARDS, B. N. **Caribbean Pine in Queensland: (*Pinus caribaea*) some notes on its behaviour and potentialities.** In *Res. Notes Qd. For. Serv.* No. 4 [1955?]. pp. 9 + 1 photo, 1 gph. 1 ref.

The performance of this species, to date, in coastal Queensland has been most promising. Its wood quality, as far as can be estimated, will be superior for many purposes to that of *P. elliottii*. Provided that its general form can be improved, it should prove a valuable plantation species. [Cf. *F.A.* 18 No. 174.]

322. CARON, G. Un essai d'acclimatement de chênes rouges d'Amérique. [**An experiment in the acclimatization of *Quercus borealis*.**] *Bull. Soc. for. Franche-Comté* 29 (2), 1956 (87–8). [F.]

Gives details of increment and production of different assortments of two trees of *Q. borealis* planted in 1890, and two of their progeny (68 and 77 years old), all felled in 1956. The species regenerates naturally in Eastern France and should be useful for planting on poor sites.

323. GERASIMOV, M. V. Interesnye fakty iz rabot po akklimatizacii èvkaliptov. [**Interesting facts from work on the acclimatization of Eucalypts.**] *Bot. Ž.* 41 (2), 1956 (229–35). 13 refs. [Russ.]

Experiments were carried out at Mukachevo in the Ukraine to determine the hardiness of Eucalypts. Between 1950 and 1953, 5000 plants in all (70 species, forms or hybrids) were raised, mostly by direct sowing of seed from Western Georgia. After 3 winters with temperatures of − 18 to − 21° C. for short periods, 294 Eucalypts (12 species, 7 Caucasian forms and 6 hybrids) survived. All were annually killed to stump level, but coppiced again. After the extremely cold winter of 1953–54 with minima of − 30° to − 37° C. only 5 plants, all of *E. rubida* f. *amabilis*, were still alive in the spring; three of these had been sown direct and two planted as seedlings. Other observations made were that seedlings from late autumn sowings, usually emerging in April, were more resistant to late frosts and as a rule grew better, than those from spring sowings. Comments are also made on the occurrence of whorled leaves on some of the plants, occasional leaf shedding and precocious flowering, and cases in which the taproot and stump had died after the shoots had been cut

back by frost, but had been replaced by adventitious roots from the shoot bases.

324. GOES, E. DA S. R. Rapport sommaire sur les *Eucalyptus* au Portugal. [**Summary report on Eucalypts in Portugal.**] [*Docum.*] *2nd Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/8-C*, 1956. pp. 11. 20 refs. [F.] Limited distribution.

325. THIRGOOD, J. V. **Research Record No. 1. Progress report on work on Eucalypts 1954–1956.** *Tech. Pamphl. For. Dep. Cyprus* No. 18, 1956. pp. 11.

Lists trial sites, and species being tried, and gives notes on research projects on nutrition, site requirements, nursery work, seed testing etc.

326. MANGIERI, H., and YACUBSON, D. El género *Eucalyptus* en la República Argentina. Estudio forestal sobre las especies más cultivadas. [**The genus *Eucalyptus* in Argentina. A study of the most widely cultivated species.**] *An. Adm. nac. Bosques, B. Aires* 1956 (85–142 + 16 plates). 17 refs. [Span.]

Introductory notes on the silvicultural characters of Eucalypts and on seed collection, germination, sowing and planting, are followed by a description of the genus, of the species most widespread in Argentina and of the regions where they are cultivated. An account is given of some large-scale plantations and observations are presented on some species tried out at Argentine Forest Service Experiment stations.

232.12. Races and Provenance Trials

See also Nos. 113, 185, 231, 233, 235.

327. SCHMIDT, W. Lärchenherkünfte und *eurolepis*-Bastarde im nordwestdeutschen Küstengebiet (Versuchsfläche Bremerförde). [**Trials of Larch provenances and of × *Larix eurolepis* on the N.W. coast of Germany (Bremerförde trial plots).**] *Allg. Forst- u. Jagdztg.* 126 (1), 1955 (24–8). 8 refs. [G.g.e.]

Reports on one of two German trial plots established in 1943–44 as part of IUFRO's international trials, containing 25 alpine, several Sudeten, Tatra, Scottish and unidentified German provenances (including *L. leptolepis*), two provenances of *L. sibirica*, and one × *L. eurolepis* from Sweden. Some mean absolute heights and relative height growth for each of the last 4 years (in % of that of the best alpine provenance) are tabulated. Tatra and Sudeten Larches, and × *L. eurolepis* were superior to the alpine races. *L. sibirica* from lat. 64°, but not that from lat. 52°, failed. [Cf. *F.A.* 14 No. 254.]

328. SCHOBER, R., and MEYER, H. Douglasien-Provenienzversuche. [**Provenance trials with Douglas Fir.**] *Allg. Forst- u. Jagdztg.* 125 (5), 1954 (160–79); 126 (11/12), 1955 (221–43). 31 refs. [G.e.]

Discusses results of trials involving 20 provenances (3 German) planted in 12 German, 1 Danish and 1 Hungarian locality, and a further series of 13 provenances in Gahrenberg (near Hann. Münden), established in 1932–33 by Wiedemann and Geyr von Schweppenburg respectively, tabulating data on height and diameter growth, volume/ha., and frost and disease resistance.

329. JAHN, G. Gegenüberstellung deutscher und amerikanischer Douglasien-Provenienzversuche. [**A comparison of German and American Douglas Fir provenance trials.**] *Allg. Forst- u. Jagdztg.* 126 (4), 1955 (68–76). 12 refs. [G.g.e.]

Compares trials started in 1910–11 by the Pacific Northwest Forest Experiment Station, Portland, Oregon [cf. *F.A.* 5 p. 67] with German trial plantings at Chorin (Schwappach, 1910), Kaiserslautern (Münch, 1912), and at Freienwalde, Braunlage and Gahrenberg (Prussian Forest Research Department, 1930) in respect of mean height at 18 and mean d.b.h. at 24 and 28 years of various provenances of *viridis*, *glauca*, and *caesia* varieties, showing the great influence of site and particularly climate, which, however, does not affect all genotypes alike.

330. **Supplement No. 1 to the original working plan of September 12th, 1952, for the southwide Pine seed source study.** Southern Forest Experiment Station, New Orleans, La. 1956. pp. 110.

Summarizes the original aims [see *F.A.* 14 No. 3272], and changes in programme and procedure since become necessary, and records co-operating nurseries and test plantations, with data on provenances tested at each and testing places for each provenance.

331. HOLMES, C. H. **Plantations and provenance trials of Teak in Ceylon.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO/56/22/108*, 1956. pp. 2. 2 refs.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165 and Nos. 280, 327.

332. **Statistical methods in experiments. [Questionnaire concerning measurements and observations in Poplar experiments and replies from Switzerland, United Kingdom, Belgium, Spain, U.S.A., Austria, Sweden, and France.]** [*Pap.*] *8th Sess. int. Poplar Comm. Madrid 1955* No. *FAO/CIP/77*, 1955, pp. 8; [*Pap.*] *12th Sess. stand. exec. Comm. int. Poplar Comm., Brussels 1956* Nos. *FAO/CIP/CP/7-A* to *-H*, 1956, each pp. 3. [E. or F.] Limited distribution.

333. RÄDER-ROITZSCH, J. E. Der Pappel-Probeanbau vom Jahre 1951 in Süddeutschland. [**Poplar trials of 1951 in Southern Germany.**] *Schweiz. Z. Forstw.* 107 (8/9), 1956 (444–57). 8 refs. [G.f.]

Discusses results, and tabulates mean values of mortality, height and diameter growth, and injuries, from 150 trials covering the first 3 growing seasons of the following: × *Populus regenerata*, × *P.* 'Bachelieri', × *P. vernirubens*, × *P. serotina*, × *P.* '*canadensis*' Leipzig, × *P. marilandica*, × *P. robusta* I, × *P. robusta* II (Isarpappel) and × *P. gelrica*, planted as 1- or 2-year-old stock.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 377, 380, 385, 391–3, 399, 466–8, 476.

334. BARROS, D. PAES DE. Observações sôbre sistemas de preparo do solo em silvicultura. **[Methods of soil preparation in afforestation.]** *Rev. Agric., Piracicaba* 31 (2), 1956 (79–82). [Port.] A.P.B.

Four different kinds of treatment were given in São Paulo to sites being prepared for planting with *Eucalyptus globulus*, having special regard to attack by termites and ants (*Acromyrmex* sp.) and to the initial development of the plants, viz: (1) burning, ploughing and harrowing; (2) burning and trenching; (3) ploughing, harrowing and trenching; and (4) trenching only. In each plot 1600 plants were planted. By far the best results, with regard to both height at 6 months and control of termites and ants, were obtained with (1). In all plots the customary soil treatment was given with arsenic against termites and with BHC against ants.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 98, 375, 439.

335. ISAAC, L. A. **Tentative guides for the selection of plus trees and superior stands in Douglas Fir.** *Res. Note Pacif. Nthwest For. Range Exp. Sta.* No. 122, 1955. pp. 9. 5 refs.

336. BOUVAREL, P. Les dangers d'abâtardissement des peuplements de grande valeur: mesures de conservation. **[The dangers of hybridization in élite stands: protective measures.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/106, 1956. pp. 7 + smry. [F.e.]

Discusses the danger of deterioration in high-quality forest stands through natural hybridization from adjacent plantations of inferior provenances, giving some examples from France, and suggests regulations calculated to prevent such damage.

337. FLORENCE, R. G. **Observations on the dispersion of pollen from a Slash Pine plantation: its possible effect in contaminating a Slash Pine seed orchard.** In *Res. Notes Qd. For. Serv.* No. 5, 1956. pp. 7 + 1 gph. 1 ref.

Observations on the dispersion of pollen from a *Pinus elliottii* plantation have been made during each of three successive years. Widely differing patterns of pollen dispersion were found, but it is suggested that, apart from those years in which a typically dry winter coincides with a heavy pollen crop, contamination of the adjacent seed orchard will be negligible. *From author's summary.*

338. FLORENCE, R. G., and MCWILLIAM, J. R. **The influence of spacing on seed production: its application to forest tree improvement.** *Res. Notes Qd. For. Serv.* No. 2 [*n.d.*] pp. 19 + 2 gphs. (Also a shorter version in *Z. Forstgenet.* 5 (4), 1956 (97–102). [E.e.f.g.].)

A study was made on 'free growth' plots of *Pinus elliottii* (13 years 9 months), *P. taeda* (12 years 9 months), and *Araucaria cunninghamii* (16 and 18 years), with a range of stocking from 50 to 800/acre. It is concluded that *P. elliottii* stands, 13–16 years old and ca. 50 ft. high, can be expected to produce, on the average, 27 lb. of viable seed per acre when grown at optimum spacing of 19 × 19 ft. (120 stems/acre); maximum seed production on single trees of *P. elliottii* and *P. taeda* at this stage of development can be expected at a spacing of 30 × 30 ft. or wider (50 trees/acre). For *A. cunninghamii*, no definite figure can be given, but it is evident that, from 16 to 18 years, viable seed will be produced only at wider spacings; for the maximum production of seed/acre a spacing of ca. 20 × 20 ft. (100 trees/acre) is recommended, and for maximum production on single trees, a wider spacing, 30 × 30 ft. (50 trees/acre) should be adopted.

339. PAIXÃO-CORREIA, C. A. DA. Sobre a formação de gomos florais adventícios em estacas de *Quercus suber* L. tratadas com os ácidos 1-naftaleno-acético e indol-3-acético. **[The formation of adventitious flower buds on cuttings of *Q. suber* treated with 1-napthalene-acetic acid and 3-indole-acetic acid.]** *Portug. Acta biol.* 4*A* (3), 1955 (249–63 + 3 plates). 41 refs. [Port.port.e.] O.B.D.

Branches 2–3 years old on 10- to 15-year Cork Oak, and 1-year-old coppice shoots still on the parent plant, were treated with both acids in lanolin paste. The paste was applied in 3 concentrations, 0·25, 0·50 and 1%, either to an annular incision or to 3 longitudinal incisions cut along the axis of the branch. The wounds were then wrapped in moss. The experiments began in June–Aug. 1953, and during the period August to February the branches were severed from the trees and put in water. Flowering began in April–May. Only the lowest concentration (0·25%) induced flowering. *From author's summary.*

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 133, 401.

340. **[Germination tests of rain-forest species.]** *Rapp. Inst. nat. Étude agron. Congo belge 1954*, 1955 (107–9). [F.]

Tabulates, for the seed of 25 species at Yangambi, the season and method of collection and cleaning, numbers/kg., germinative energy and capacity, and maximum keeping period in free air and/or stratified.

341. HOPKINS, D. R. **The Osborne tree cone cutting knife.** *J. For.* 54 (8), 1956 (534).

Describes, with a scale drawing, a knife, made by the State of Washington Division of Forestry, for cutting cones longitudinally to determine seed content.

342. ANDRESEN, J. W. **A collecting hook for Yellow-Poplar [*Liriodendron tulipifera*] fruit.** *Tree Plant. Notes* No. 25, 1956 (22–3).

Description, with scale plan, of an implement devised at Rutgers University, easily and cheaply made from aluminium plate.

343. DALMADY, J. Pestovanie a pestebné využitie borievky. [**Growing *Juniperus communis* and its application in silviculture.**] *Les, Bratislava* 2 (10), 1955 (429–31). [Slovak.]

Results of tests made in forest nurseries in 1953–54 show that Juniper berries should be collected in June–July, at 14 to 15 months old, only the red berries being collected; sowing should be done as soon as possible after collection, in order to preserve the germinative capacity, the thick pulp being crushed before sowing; best germination results were obtained by sowing rather deep in a light soil, mineral soil rather than humus. The seedlings develop well both in grass and under shrubs. Small-scale transplanting trials with 1-year seedlings reared under shrubs gave encouraging results.

344. ALLEN, G. S. **The effect of date of cone collection upon the viability, germination behaviour, and storage characteristics of Western Hemlock [*Tsuga heterophylla*] seed.** *For. Chron.* 32 (2), 1956 (262–3). 1 ref.

Summary of a paper to be published in full at a later date. Early (ca. Sept. 15) collection produces a good yield of highly viable seed which stores perfectly for at least two years.

345. PUDDEN, H. H. C. **Seed collection—*Pinus patula*.** *Tech. Note For. Dep. Kenya*, Nos. 38, 43, 1956. Each pp. 1.

Cones which sank in engine oil of SAE 20 but floated in oil of SAE 30 shed seeds easily in a test carried out on a mid-March collection in Kenya. Seeds averaged 93 per cone and clean seeds 67,700/lb. One ton of cones should yield 33¾ lb. of clean (de-winged) seed. There is a loss of 25% of winged weight in cleaning. A pound of clean seed produced 43,000 plants. (All data are from a single tree.)

346. FOSTER, A. A. **Opening case-hardened Southern Pine cones.** *J. For.* 54 (7), 1956 (466–7). 12 refs.

Although a specific gravity of 0·89 is the accepted criterion of maturity in Slash and Loblolly Pine cones, intense competition necessitates the purchase of immature cones, many of which will not open on drying. Mechanical rolling, especially after a sprinkling with water, will open these and release the seed.

347. DARBY, S. P. **Georgia's new de-winger.** *J. For.* 54 (9), 1956 (579–81). 4 refs.

Since the standard equipment used for Pine seed extraction and cleaning reduced germination by 12–15%, experiments were tried with a popcorn-polisher, Crippen Model EP-26. Several pounds of uncleaned seed of Slash Pine, passed once through the polisher, were adequately cleaned without injury. The machine, adopted for use in 1955, raised germination by 25% for *Pinus elliottii* and 27% for *P. taeda* as compared with the Forest Service de-winger. Illustrations and a description of the working of the Crippen model are given.

232.315. Seed Storage and Treatment

See also Nos. 221, 340, 382, 439.

348. SATO, Y. [**On the viability of Salicaceae seeds.**] *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (225–66). 35 refs. [Jap.jap.e.]

From a study of the effects of temperature, Adsol, K_2S, sealing, and evacuating and sealing the containers, on the viability of seeds of *Populus sieboldii, P. maximowiczii, Toisus* [*Salix*] *urbaniana, Salix bakko*, and *S. jezoensis*, the following recommendations are made: (*a*) seed moisture should be reduced by mixing with an equal or twice the weight of Adsol; (*b*) as (*a*), but adding K_2S at 10% of the seed weight; (*c*) K_2S alone at 20–150% of the seed weight; (*d*) constant cold storage below zero (−8° C.) with desiccating agents in air-tight containers; (*e*) constant cold storage in evacuated containers (better than (*d*)). The germinations obtained at 30-day intervals up to 2047 days are shown in 17 tables. Germinations of *P. sieboldii* were > 40% after 1655 days with methods (*a*), (*b*) and (*e*), and of *P. maximowiczii* 70, 76 and 86% after 586 days with methods (*a*), (*e*), and (*c*), the last at low temperature.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 325, 340.

349. GUSTAFSSON, A., and SIMAK, M. **X-ray diagnostics and seed quality in forestry.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/22/102, 1956. pp. 10 + smry., 1 photo., 2 dgms., 3 gphs. 19 refs. [E.e.]

The authors summarize their work on the use of X-ray photography for determining viability of forest tree seeds [cf. *F.A.* 15 Nos. 3475–6]. Embryo and endosperm development can be adequately determined without injury to the seed. Equations are formulated in connexion with X-ray analysis and germination in the Jacobsen germinator as well as in soil. Impregnation of seeds with salts of heavy metals ($BaCl_2$ and others) before photography, allows of determining germinability also in stored, partially or entirely dead seed. Other subjects discussed are the influence of climate (altitude and latitude) on embryo development, and the influence of embryo size, and location within the embryo channel, on rate and time of germination. A list of tree species analysed is given. *From authors' summary.*

350. MAGINI, E. La radiografia come mezzo d'analisi dei semi forestali. [**Radiography as a means of testing forest seeds.**] *Ital. for. mont.* 11 (2), 1956 (65–8). 15 refs. [It.f.]

Describes the Swedish method of classifying forest seed into embryo classes revealed by X-ray photography.

351. ANDRADE, D. XAVIER DE. Germinação de sementes de essências florestais. [**Germination of seed of forest species.**] *Brasil madeireiro* 11 (112), 1956 (20–2). 2 refs. [Port.]

Lists 33 species from north-eastern Brazil and 9 other species, giving the number of days required

before the initiation of germination. The findings are based on research by the Forestry Department of the Escola de Agronomia do Nordeste.

232.32. Plant Rearing. Nursery Practice

See also Nos. 325, 377, 401.

352. STERN, K. Über die Anlage und Auswertung von Versuchen im forstlichen Pflanzgarten. **[The lay-out and evaluation of forest nursery experiments.]** *Z. Weltforstwirt.* 18 (5/6), 1955 (207–14). 3 refs. [G.g.]

Discusses the peculiarities of nursery experiments as contrasted with other forest and agricultural experiments, emphasizes the need for taking account of soil differences, and gives a practical example of the application of the principles of design and statistical evaluation discussed, to a test with 11 Poplar hybrids.

353. MAHLSTEDE, J. P. **Polyethylene in plant propagation.** *Amer. Nurserym.* 104 (5), 1956 (13–4, 84–92).

Reviews uses of this substance for covering seedbeds, packing and storing planting stock, protecting grafts and air-layers etc.

354. HOWARD, J. A. C. **Preliminary nursery investigations, Nyika Plateau (Nyasaland) [from observations made in 1953].** *Emp. For. Rev.* 35 (3), 1956 (302–12). 17 refs.

The following recommendations are made. Fresh seed of *Pinus caribaea* and *P. taeda* should be sown at 1 oz./3 sq. ft. and covered with $\frac{3}{8}$ in. of sand; *P. patula* at 1 oz./4 sq. ft., with $\frac{1}{4}$ in. sand. To control damping off, seedbeds should be watered with 1 oz. $KMnO_4$/2 gal. water/ 4 sq. yd. at time of sowing and at first germination. Overhead shade 3–4 in. above the beds should be used to protect seedlings against night frost in May and June. Germination of *P. patula* is improved by shade 3–6 in. above the beds. Transplanting should be done 3–5 weeks after germination and, to obtain 6- to 9-in. transplants by December, seed of *P. caribaea* and *P. taeda* should be sown in March, seed of *P. patula* in Dec.–Jan. After transplanting, only a few weeks of night shading against frost are required; *P. caribaea* and *P. taeda* should be root-pruned weekly, *P. patula* every fortnight; 1 gal. water is required for 15 sq. ft. of transplant bed, evening watering being preferable. *From author's summary.*

355. FINNERTY, P. **Note on the raising of Birch from seed in the nursery.** *Irish For.* 13 (1), 1956 (17–8).

Birch [not further specified] is successfully raised at Monaghan nursery, by the following method: Seed is collected in dry weather in Sept., stored in a dry place till Feb., stratified in moist sand till mid-May, and then sown broadcast in 4-ft. beds. The seed is lightly rolled in; no soil covering is used, but immediately after rolling, the beds are covered with branches (Spruce and Douglas Fir). The beds are then kept watered until germination takes place (ca. 3 weeks after sowing). The shade from the branches protects the surface from drying winds and they are retained after the first and second weeding; they are removed during damp or cloudy weather when the seedlings are established, but are replaced on the beds in Nov. and retained until the seedlings are lifted for lining out. The best seedlings are obtained from the richest ground. Ground which gave an excellent crop of Sitka or Douglas seedlings did not seem to be too fertile, or even fertile enough, for Birch.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 192, 194–5, 547, 549.

356. FAULKNER, R., and MACDONALD, A. **Inchnacardoch nursery—a long-term soil fertility trial.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/10, 1956. pp. 10.

The lay-out of the experiment, started in 1938, is described. From evidence produced between 1938 and 1950 it is clear that the repeated cropping of the soil with trees, without adding any artificial or organic manure, is very harmful. A greencrop alone, with or without potatoes preceding it, and without manures, produces no significant benefit or detriment to succeeding crops of trees. The greencrops themselves do not flourish when sown without manures of some kind. Artificial fertilizers, when applied alone, improve the height and quality of the tree crops, but not as markedly as when a greencrop is introduced into the rotation. Combinations of greencrop, farmyard manure, and artificial fertilizers produce the tallest and best plants. Lack of organic manures leads to an increase in the incidence of cockchafer attacks. *From authors' summary.*

357. BENZIAN, B., and WARREN, R. G. **Nutrition problems in forest nurseries: needle tip-burn.** *Rep. Rothamst. exp. Sta. 1955*, 1956 (49–50).

A symptom called 'needle tip-burn' has been observed for a number of seasons in Sitka Spruce seedlings and transplants at Sugar Hill Nursery, Dorset. The symptoms tended to appear after a hot spell at midsummer. This nursery is on a very acid sandy soil that had previously carried *Calluna* and scrub Pine. During 1955, foliar applications of several micronutrients (Cu, Zn, Mn, and Mo) were tested on Sitka seedlings in the nursery. On plots that had received a spray of $CuSO_4$ at the rate of 0·16 g. Cu in 300 ml. water/sq. yd. in June, tip-burn symptoms were completely absent until mid-August and developed only slightly during the rest of the season. Plots without $CuSO_4$ showed tip-burn from early August, the symptoms increasing in severity throughout the summer and autumn. At the end of the season, the mean height of the controls was 1·9 and of the 'copper' plots 2·8 in. None of the other micronutrients appear to have reduced the symptoms. In experiments on seedlings and transplants raised in 1955 to test fertilizers and compost made from bracken and hop waste, tip-burn developed on fertilizer-treated plots but was absent from compost plots. The hop waste used in the making of compost is known to contain several hundred p.p.m. of Cu, and a compost dressing of 10 lb./sq. yd. generally prevents the appearance of the symptoms.

358. DUNN, S. **Influence of lignin and other waste materials on plant growth.** *Lilloa* 27, 1953 [1955] (49–73). 7 refs. [E.e.span.] A.P.B.

Water and sand cultures of plants [tomatoes, sunflowers etc.] were grown, to which finely divided lignin and other colloidal materials were added as texture modifiers. They were without effect in water cultures and they aided growth in sand but not in gravel. The effect is probably one of increased surface contact between root-hairs and sand particles. Plants were grown in soil cultures to which lignin and other organic materials were added, both as single crop cultures (non-residual) and as successive cultures for the residual effects of these substances on several crops in the same soil. In each group some individual crops showed benefit from the treatments in comparison to crops grown in soil only, but the average differences were not great enough to be significant. It appears from this that there are certain benefits from such treatments, which cannot be realized or made evident in greenhouse cultures. These would come from increased speed of penetration of rainfall, improved structure, increased ability to hold nutrients against leaching etc. All these are far more effective on crops grown in outdoor plots, and that is where the possible benefits of such organic additions to the soil should be measured. A possible exception to this would be the preliminary testing of the speed of a given composting process. This might well be done in greenhouse cultures. Additions of lignin to soil were without effect in increasing the starch content of potato tubers in comparison to those in soil without lignin. The plants were of the Katahdin variety which is known to be ordinarily low in starch. Shredded [conifer] bark appeared to have some value in minimizing the toxic effects of high amounts of nutrient salts in the soil, and other than that, its beneficial effects are doubtful. Applications of distillery waste to soil gave no benefit to crops grown in such soil in comparison to the controls. Sand cultures with composted sawdust [species not stated] showed that this material may be valuable in increasing yields if the composting has progressed long enough. This is further substantiated by experiments on crops grown in pure sawdust in comparison to a mixture of sawdust and soil, and soil only. Further study is needed on these points, especially on methods of composting or other methods of breaking down sawdust and like materials more rapidly. It seems evident that one important factor may be the maintenance of proper moisture contents of the composts, since these received none other than that from natural precipitation. *Author's summary.*

232.323. Sowing and Covering

See also Nos. 343, 353.

359. FOSTER, A. A. **The effect of seedbed density on seedling production at the Georgia forest nurseries.** *Tree Plant. Notes* No. 25, 1956 (1–3).

By using a seedbed density of 40/sq. ft. instead of 30/sq. ft. for Slash and Loblolly Pine, production/acre of plantable seedlings was increased from 871,200 to 1,161,600. The number of seedlings of $\geqslant \frac{3}{16}$ in. stem diameter was not changed by varying density.

232.325. Tending (in both Seedbeds and Transplant Beds)

360. RICHARDS, B. N. **Chemical control of weeds in Southern Pine nurseries. I. Pre-emergence weedicides. II. White spirit as a post-emergence weedicide.** *Aust. For.* 20 (1), 1956 (8–17). 7 refs.

Tests were made of a number of weedkillers, applied to seedbeds of *Pinus elliottii* just before germination. The mineral oils, 'Vacuum' white spirit (50 gal./acre) and 'Sovacide P.Y.' (25 gal./acre) gave satisfactory control of weeds with no ill effects on germination or survival of the Pine. PCP (Na salt) gave excellent control of weeds but reduced germination and caused heavy mortality in the seedlings that did emerge. $ZnSO_4$ had the same defects and the further disadvantage of a delayed effect on weeds. The mineral oils also gave satisfactory results when applied as post-emergence sprays at 35, 50, and 70 gal./acre.

361. SOSTER, P. Sperimentazione di diserbanti chimici nei vivai forestali. **[Experiments with chemical weedkillers in forest nurseries.]** *Monti e Boschi* 7 (7), 1956 (303–16). [It.f.e.]

Gives detailed accounts of experiments at 4 forest nurseries in Verona province, using (1) Pantox (containing chlorinated organic compounds), (2) Florwis (Na 2,4-D ethyl sulphate), (3) Esso Weed Killer 35 (petroleum derivative) and (4) Fenoxilene (30% MCPA) and Fenodit (ester of a chlorophenoxyacetic acid). (1) and (2) are complete weedkillers and also kill almost all tree seedlings, so can only be used for pre-sowing or pre-emergence treatments; (3) and (4) are selective for conifers, and detailed instructions are given for applying them to conifer seedbeds.

362. HOLM, L. G., and TAYLORSON, R. **Mixtures of herbicides for nursery weed control.** *Proc. 12th. ann. Nth. Cent. Weed Control Conf.* 1955 (51–2). O.R.E.

Two-year seedlings of *Picea pungens*, *P. glauca* var. *glauca*, *Pinus sylvestris*, *Juniperus lucayana*, *Pinus nigra* var. *austriaca*, *P. strobus*, *Thuja* sp. and *Pseudotsuga taxifolia* were treated in spring with the following herbicides: SES, SESIN(2,4-dichlorophenoxyethyl benzoate), Natrin (2,4,5-trichlorophenoxyethyl sulphate), Methin (2-methyl, 4-chlorophenoxyethyl sulphate), CMU, and NP (naphthylphthalamic acid). Mixtures of SES with CMU or NP ($\frac{1}{2}$ lb./acre CMU + 4 lb./acre SES; $2\frac{1}{2}$ lb./acre NP + $2\frac{1}{2}$ lb./acre SES) gave 90 to 100% control in the first 10 weeks. The plots were treated again in April of the following year with the mixtures and with SES, and the superiority of the mixtures was confirmed. No injury was suffered except slight retardation of growth in *P. glauca* var. *glauca* and *P. taxifolia* where NP was used thrice in two seasons.

363. CHADWICK, L. C., and BARKER, P. A. **Tolerances of certain nursery stock to CMU and SES.** *Abstr.* in *Proc. 12th ann. Nth. Cent. Weed Control Conf. 1955* (52). O.R.E.

No damage was sustained by 2-year-old Norway Spruce and Japanese Maple, 3-year-old *Taxus cuspidata* and 4-month-old *Forsythia intermedia spectabilis* from 3 applications of CMU, SES, and combinations of both, at rates of ½ lb./acre CMU, 4 lb./acre SES and (in mixture) ½ lb./acre CMU + 4 lb./acre SES. Flowering Dogwood was killed by SES.

364. CHADWICK, L. C., BARKER, P. A., and CHAMBERS, W. D. **Chemical weed control in a *Taxus* nursery.** *Abstr.* in *Proc. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (52). O.R.E.

Best weed control among *Taxus cuspidata* var. *intermedia* was obtained with CMU at ½ lb./acre plus SES at 4 lb./acre applied in water equivalent to 86 gal./acre. No damage was sustained by the Yew.

365. DARBY, S. P. **Agitator type sawdust spreader for use on dump trucks.** *Tree Plant. Notes* No. 25, 1956 (8–10).

Describes and illustrates a special tail gate for attaching to the back of a lorry, so that sawdust can be spread directly to any desired depth on nurseries etc. It was made in the Georgia Forestry Commission's workshop and cost ca. $150.

366. FARNSWORTH, C. E., LEA, R. V., and ENGELKEN, J. **Mulching coniferous transplant beds with sawdust.** *Tree Plant. Notes* No. 25, 1956 (4–7).

A series of experiments in which sawdust [2 parts hardwood, 1 part softwood] was applied to coniferous transplant beds showed that: (1) A sawdust mulch 1¼ in. deep placed on autumn transplant beds effectively controlled frost heaving during the following winter for the species tested [*Picea abies*, *Tsuga canadensis*, *Pseudotsuga taxifolia* and *Pinus strobus*]. (2) The mulched transplants grew more rapidly, with few exceptions, than the unmulched. (3) The evidence suggests that a mulch 1¼ in. deep was more effective in increasing height growth than depths of ¾ or 2 in. *From author's summary.*

232.327. Protection Measures in Nurseries

See also Nos. 540–1, 591–2, 595.

367. VAARTAJA, O., and CRAM, W. H. **Damping-off pathogens of conifers and of Caragana in Saskatchewan.** *Phytopathology* 46 (7), 1956 (391–7). 37 refs.

In further investigations of damping-off in prairie provinces nurseries, mostly on alkaline soil, thousands of isolates were made from diseased seedlings. The most numerous were species of *Fusarium*, *Pythium*, *Rhizoctonia*, *Alternaria*, *Phoma* and *Cylindrocarpon*. Seedlings of *Pinus banksiana* and *Caragana arborescens* in sterile culture were killed in a few days when inoculated with most isolates of *Rhizoctonia* and *Pythium*, but isolates of the other genera named (including 8 species of *Fusarium*) and of many other genera tested were less pathogenic. In greenhouse tests with unsterilized soil *R. solani* considerably reduced the emergence of Pine and Caragana but not that of Spruces. Post-emergence losses were heavy in Pine and Caragana, and significant in one progeny each of *Picea glauca* and *P. pungens*. *Pythium* (*debaryanum*?) was slightly pathogenic to all seedlings and significantly so to one Spruce progeny. A mixed inoculum caused less mortality than *Rhizoctonia* alone, suggesting the occurrence of a useful microbiological antagonism evidenced by the decreased virulence of the fungi in unsterilized soil. [Cf. *F.A.* 15 No. 1493.]

368. VAARTAJA, O. **Screening fungicides for controlling damping-off of tree seedlings.** *Phytopathology* 46 (7), 1956 (387–90). 18 refs.

Reports on the degree of control effected by 109 chemicals on *Rhizoctonia solani* and *Pythium debaryanum* in tests with Pine and Birch seeds in Petri dishes. Most of the chemicals were phytotoxic or failed to control. Rimocidin (a highly fungicidal antibiotic from *Streptomyces rimosus*), captan, and thiram, at a wide range of concentrations, controlled the diseases best and without marked phytotoxicity. They deserve further field trials. The last two have performed well in repeated seedbed trials. [Cf. *F.A.* 13 No. 3784; 15 No. 1291.]

369. VAARTAJA, O. **Notes on low temperature fungi.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (3).

Gives some account of attempts to isolate the pathogen causing 'red-patch' disease of *Picea glauca* seedlings and to produce the disease by inoculation with artificial cultures. Experiments in high humidity gave some evidence for the pathogenicity of *Pestalotia* spp. but no certain conclusions have yet been reached.

370. VAARTAJA, O., and WHITNEY, R. D. **Spread of 'red patch' disease [of *Picea glauca*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (3).

Experiments in interspersing diseased seedlings among healthy ones suggest that transplanting seedlings from 'red patches' [cf. *F.A.* 16 No. 626] is not likely to cause loss in plantations, but the practice should be avoided as far as possible. The disease appears to be of importance primarily in seedbeds and, to a less degree, in transplant lines in nurseries under poor growing conditions.

232.328. Vegetative Propagation

See also Nos. 98, 109, 236, 315, 353.

371. SAITO, Y. **[The effect of spraying cuttings with plant-growth-regulating substances on the rooting of *Salix gracilistyla*.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (919–27 + 1 photo). 13 refs. [Jap.jap.e.]

The tops of leafless cuttings with their bases set in thermostatically controlled water were sprayed with K indoleacetate (K IAA); Na α-naphthaleneacetate (Na NAA), maleic hydrazide and Na salt of 2,4-D. Temperatures of 25–27° C. and light or darkness made no significant difference. Na NAA, at 10–100 p.p.m. produced the best budding and rooting. K IAA at the same concentrations was also good. Generally the same concentrations are effective in spraying as in basal immersion.

372. SMITH, J. H. G., HADDOCK, P. G., and HANCOCK, W. V. **Topophysis and other influences on growth of cuttings from Black Cottonwood [*Populus trichocarpa*] and Carolina Poplar [× *P. eugenei*].** *J. For.* 54 (7), 1956 (471–2). 4 refs.

The influence of species, age, length, diameter, depth of planting, and position of cuttings in the tree (topophysis) were investigated in greenhouse experiments on 48 cuttings taken from a 7-year-old Carolina Poplar and the same number from a 3-year-old Black Cottonwood. Equal numbers of cuttings were taken from 1- and 2-year-old wood growing in each of 3 positions: leader, first primary branches, and secondary branches. Two lengths of cutting, 3 and 6 in., were also tested as a main factor. It is concluded from the results that the position in the crown from which cuttings are taken had an important influence on both height growth and survival of cuttings, and would probably be of even greater importance if cuttings were taken from mature trees. Black Cottonwood grew at about 4 times the rate of Carolina Poplar and side-wood cuttings grew vigorously, but in both species best results were obtained from 6-in. cuttings of 1-year leader wood. There are indications that the great vigour of all parts of the 3-year-old tree to some extent masked the influence of topophysis, evident in the older tree.

373. MANGENOT, J. Recherches sur la transpiration des boutures de pin maritime. **[Transpiration of cuttings of *Pinus pinaster*.]** *Rev. gén. Bot.* 63 (743), 1956 (5–21). [F.] O.B.D.

The studies used both volumetric and gravimetric methods and two types of specimen, (*a*) showing a basal wound callus similar to that made in air layering, and (*b*) without callus. For (*a*) minimum intensity of transpiration was ca. 0·5 c.c./g./day (winter) and the maximum 1·2 c.c. (June). Transpiration was markedly reduced by humidity. In the course of the day the maximum was reached between noon and 2 p.m. When the branches were separated from the tree, the quantity of water transpired was always greater than that absorbed by the cut section of the stem. For (*b*) the results were similar but the quantity of water taken up was much reduced. As a result the cuttings dried off rapidly and the needles had to be kept moist in order to reduce transpiration.

374. MERGEN, F. **Vegetative propagation of Slash Pine.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 54, 1955. pp. 63. 115 refs.

Reports on 9 experiments on the effect of collecting times, rooting media, environment, and various physical and chemical treatments (such as storing, or wounding, and the application of growth regulators, nutrients or fungicides), on the striking and survival of cuttings taken from trees aged 10–25 years, and on air-layering [cf. *F.A* 16 No. 4026], the latter proving the most promising technique. The best time to take cuttings was found to be at the beginning of the dormant period. Most treatments had no beneficial effects, but Ferbam and Phygon XL were helpful against fungi. Indolebutyric acid at 0·8%, beneficial in air-layering, was lethal to cuttings. Previous work on grafting is summarized. [Cf. *F.A.* 16 Nos. 411, 2934, 2935.]

375. HOFFMANN, K. Pfropfmethodische Untersuchungen im Freiland für die Anlage von Samenplantagen. **[Experiments in methods of open-air grafting for the establishment of seed orchards.]** *Abstr.* in *Z. Forstgenet.* 5 (4), 1956 (128). [G.]

Practical recommendations from experience at the Waldsieversdorf tree-breeding station.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

376. MEYER, H., and LAUE, K. Über die Anzucht einiger Nadelholzarten in Frühbeetkästen. **[Raising some conifer species in cold frames.]** *Forst- u. Holzw.* 11 (7), 1956 (139–41). [G.]

The frames were filled to a depth of 18 cm. with a mixture of 25% compost, 25% sand and 50% Spruce litter on a tight-trodden layer of leaf litter, and sown in drills. The method allowed the production of sturdy plants for transplanting owing to the longer growing season, but in view of its high cost, it is chiefly recommended for expensive exotic seed.

232.33. Formation of Stands by Direct Sowing

See also Nos. 206, 323, 399.

377. MARION, J. Les repeuplements artificiels en chêne-liège dans la forêt de la Mamora (Maroc). **[The artificial regeneration of *Quercus suber* in the Mamora forest (Morocco).]** *Ann. Rech. for. Maroc 1953–1955* No. 2, 1955 (39–158 + 26 photos). 34 refs. [F.f.e.span.]

In this region, where sand overlies impermeable clay, and both annuals and rhizomatous grasses flourish, the key to success in re-introducing Cork Oak lies in the maximum conservation of soil water by dry-farming methods. Direct sowings are cheaper, simpler and at least equal in success to planting. The area (minimum 20 ares) is clear-felled and the shrubs and herbs completely eradicated. A general ploughing 0·2–0·3 m. deep is made immediately before sowing nests of 10 acorns, at 3 × 3 or 3 × 1 m. (100–300 kg./ha.). Seed at 75–120/kg. from selected trees should be sown (3–8 cm. deep) within 24 hours or, failing this, stratified thinly in moist sand and sown within 14 days (Nov.–mid-Dec.). The complete suppression of herbs and grasses competing for water involves 2 machine cultivations in each of the first 3 years, with a possible reduction to one in the 4th, and eradication of creeping grasses in the dry season. Cultivation is done between October and end of January, and in April when the herbs are still young. The best growth is where the clay underlies the sand at 0·4–0·8 m. on a slight slope, often indicated by a cover of dwarf palm (*Chamaerops humilis*) which itself provides valuable side shelter. Beeting should be done in the second and third years. Protection against grazing and seed-eating crows, wood pigeon and rodents is essential. Cost and methods are similar to those for raising Eucalypts (40,000 Fr./ha.) but an earlier return might be got by mixtures e.g. with Pines, Acacias, and Eucalypts, for which trials are in train. Nursery plants, the use of which is risky and not as satisfactory under local conditions, are raised by dibbling fresh seed 10–20 cm. apart in November in raised beds. When

shoots are 2–3 cm. high (at ca. 2 months) the root is pruned back to 3–10 cm. The seedlings are lifted at 4 months and ball-planted. Potted and older plants proved unsatisfactory. An appendix by *G. de Beaucorps* examines soil conditions in detail. Graphs of the % moisture distribution in the sand layer under a clean plantation and under one invaded by *Cynodon dactylon* show how the latter reduced the summer supply.

378. VANĚK, J. Zpráva o stavu výzkumu v ochraně žaludové síje proti zvěři. (Předběžne sdělení.) **[Investigations on the protection of acorn sowings from wild animals. (Preliminary communication).]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 28 (5), 1955 (745–60). 21 refs. [Cz.cz.russ.g.]

Results of the preliminary tests can be summarized as follows: (1) CaC_2, $CaCN_2$, lysol and cresol, mixed with the acorns at a rate of 1/100 by weight, are effective deterrents of wild pig, and lysol and cresol are also effective against other ungulates; these deterrents must, however, be applied at frequent intervals, and they lose their efficacy in frosty weather; (2) where there is a risk of their being eaten, acorns should be sown early in May, after over-wintering in holes filled with snow. Nest-sown acorns in places overgrown with grass can be successfully protected by covering them with pieces of upturned turf; in sites without grass, acorns should be sown at a greater depth, and the nests should be trodden firm. Glass-wool waste, mixed with the acorns at a rate of 1/50 [by weight?] gave in some cases good protection against pigs and rodents, but failed against birds and deer; a good method of protection against these consists in planting a well developed seedling of another tree species in the acorn hole.

379. HEYDEN, D. Maschinen und Geräte für Saat und Pflanzung. **[Machines and implements for sowing and planting.]** *Forst- u. Holzw.* 11 (6), 1956 (122–6). 1 ref. [G.]

Describes and illustrates a number of sowing and planting machines, e.g. a portable hole-digger operated by a power-saw motor, soil-working machines, hand tools etc. for use on restricted areas, as approved by the German testing commission for forestry.

232.4. Formation of Stands by Planting

See also No. 534.

380. SPURR, S. H. **Plantation success in the Harvard forest as related to planting site and cleaning, 1907–47.** *J. For.* 54 (9), 1956 (577–9). 3 refs.

A survey of results from 125 conifer plantings between 1907 and 1947. All plantations on open or semi-open old fields or pastures have succeeded, especially Red Pine, Norway Spruce and White Spruce. On land which had to be cleared of trees, few plantings survived hardwood competition, Red Pine proving most successful on excessively drained sites. Cleaning is always necessary, especially for White Pine. Exotic Larches have generally been brought through, except *L. decidua* which is almost invariably killed by porcupine. Red Pine proved by far the best plantation species, succeeding with a minimum of cultural work on a wide variety of sites.

381. ALLARD, J. Organisation du travail dans les plantations forestières d'*Eucalyptus* au Maroc. **[Organization of work in forestry plantations of *Eucalyptus* in Morocco.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/105, 1956. pp. 7 + 7 dgms. [F.]

Describes the organization and phases of work in marking out the site, transport of plants, their distribution, and the actual planting.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 353, 406, 667, 704.

382. **[Planting Lolyondo [*Olea welwitschii*].]** *Rep. For. Dep. Tanganyika 1955*, 1956 (31).

Pulped fruits sown within 4 days of collection gave 81% germination against 27% for unpulped. A 1953 underplanting showed that naked-rooted plants had the best, stump plants the worst survival. The former, however, gave the lowest, and stripped saplings the best, annual growth. Once plants were > 3 ft. high, browsing damage was considerably reduced. Taungya gave good results.

383. MULLIN, R. E. **Moisture-retaining materials for nursery stock packaging.** *Res. Rep. Ont. Dep. Lds. For.* No. 34, 1956. pp. 47. 11 refs.

Comparison of sphagnum moss, locally obtained (green) moss, untreated wood wool, and wood wool treated with a wetting agent, for packing nursery stock, revealed no significant differences in survival for the different materials. There were, however, considerable differences between bales prepared with the same material on the same baling machine, which cannot at present be explained.

384. WELLENSTEIN, G. Insektenbekämpfung in Freikulturen. **[Control of insect pests in plantations.]** *Allg. Forst- u. Jagdztg.* 125 (7), 1954 (237–45). 20 refs. [G.g.e.]

Methods recommended for all but heavy infestations include dipping of surface parts of conifer transplants in 1% DDT solutions against weevils, dipping the whole plant in mixed DDT and γ BHC preparations to add protection against soil-inhabiting pests, or dipping or dusting the roots only against the latter. For heavy infestations, plant-hole poisoning is preferred to a general poisoning. Efficiency and phytoxicity of a number of German insecticides are discussed. Esters should be avoided. [Cf. *F.A.* 17 No. 3900.]

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 203, 206, 379, 392–3, 466–7.

385. QUAILE, G., and GREGORY, G. R. **Effect of ground preparation and soil on cost of hand planting.** *Mich. For.* No. 18, 1956. pp. 2. 1 ref.

Gives tabulated data on average preparation and planting times (hours /1000 seedlings) as affected by soil, ground cover, and method of ground preparation (furrowing, scalping, none) for 6×6 and $7\frac{1}{2} \times 7\frac{1}{2}$ ft. spacing.

386. PIŠKULA, F., and POSPÍŠIL, B. Srovnávací zkoušky lesních sazečů. **[Comparative tests of forest planting tools.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 28 (5), 1955 (683–708). 25 refs. [Cz.russ.g.]

Presents the results of trials made at the Czechoslovak Institute of Scientific Research on Mechanization in Forestry, with 19 planting tools, of which the following, found to be suitable, are illustrated and described in detail: (1) a new all-metal planting tool developed at the Institute, suitable for light, sandy, stony, and some heavy soils, and for 1- and 2-year seedlings; (2) the Opočno planting tool, for heavy and weedy sites, and 1-year planting stock; (3) the Polish planting tool 'Kostur No. 1', for sandy soils and 1-year planting stock, and (4) subject to the satisfactory completion of further tests, Pěnčik's planting tool.

232.43. Spacing and Arrangement in Plantations

See also Nos. 338, 760, 788.

387. VEIGA, A. DE ARRUDA. Nota preliminar sôbre o espaçamento inicial do *Cupressus lusitanica*, Mill. **[Preliminary note on the initial spacing of *C. lusitanica*.]** *Rev. Agric., Piracicaba* 30 (7/12), 1955 (199–208). 5 refs. [Port.port.e.] A.P.B.

Height and diameter measurements were made in April 1955 on *C. lusitanica* seedlings planted out in April 1954 in 4 series spaced at (*a*) 1 × 1, (*b*) 1·25 × 1·25, (*c*) 1·5 × 1·5, and (*d*) 1·75 × 1·75 m. Statistical analyses of the results show no significant variation in growth between (*a*) and (*c*), which both seem to be suitable as initial spacing for this species. [No conclusions are drawn for (*b*) and (*d*).]

388. FEKETE, Z. Hozzászólás az akáckérdeshez. **[A note on the *Robinia* problem.]** *Erdö* 4 (1), 1955 (12–8). [Hu.]

Recent Hungarian opinion is unanimous on the desirability of wide plantings of Robinia, usually at ≮ 2 m., which also permits some measure of agricultural intercropping. Comparison of yield tables of various countries shows that the volume of timber from thinnings in stands up to 25–30 years of age amounts to 14% of the total yield in Hungary, 19% in France and 33–34% in Rumania and Germany [cf. *F.A.* 15 No. 1655]. The questions relating to mixtures of Robinia with other species, soil impoverishment and regeneration of deteriorated stands are still being debated.

232.5. Artificial Formation of Stands by Vegetative Propagation

See No. 282.

233. Afforestation

See also Nos. 60, 413, 439, 524, 575.

389. PFANKUCH, D. J., and DUNCAN, D. P. **Growth of C.C.C. forest plantations in Southeastern Minnesota.** *Minn. For. Note* No. 53, 1956. pp. 2.

Ninety-six $\frac{1}{10}$-acre plots were selected for study of the growth rates and site factors that influenced results of C.C.C. plantings between 1935 and 1942. Of the 3 most abundant species, height m.a.i. of *Fraxinus pennsylvanica* var. *lanceolata* and *Pinus resinosa* was 1·4 ft., of *Robinia pseudoacacia* 1·9 ft. The two hardwoods grew most successfully on finer-textured soils (silt and clay-loam), the Pine on coarser soils (sand and loamy sand).

390. HOLLIDAY, J. C. **The planting of colliery spoil heaps.** *Coedwigwr* 2 (4), 1956 (108–14).

An account of the work of the Durham County Council in beginning a large-scale programme for the planting of colliery tips, with particular reference to financial and administrative difficulties.

391. RENNIE, P. J. **The importance of shelter to early tree growth on upland moors.** *Forestry* 29 (2), 1956 (147–53). 13 refs.

A comparison of the effects of differing methods of cultivation carried out on typical *Calluna* moor in the Cleveland (Yorkshire) massif has revealed that single-furrow deep ploughing, by reason of its pronounced plough-ridges, has advantages over other more shallow, and complete deep, methods of ploughing in giving shelter from cold on-shore winds which cause dieback. Orientation of the plough-ridges transverse to the wind direction, and the use of leeward ridge slopes as planting positions enhance this shelter effect. Attention is drawn to the need for forest meteorological research upon the relationship of wind to tree growth. *From author's summary.*

392. KLITZING, O. v. Erfahrungen bei grossflächigen Neuaufforstungen. **[Experiences with afforestation over large areas.]** *Forst- u. Holzw.* 11 (6), 1956 (115–6). [G.]

Reports on the afforestation of a large tract of heath and moorland near Lingen (on the river Ems) partly with Pine, partly with Japanese Larch mixed with Red Oak, Grey Alder, and Bird Cherry in the years 1953–55. When areas of 15–20 ha. were completely cultivated after burning, damage to Pines from drifting sand and excessive reflection from the windblown sand was considerable, while Larches and broadleaved trees suffered little. Windbreaks of Birch and Grey Alder planted simultaneously gave insufficient protection in the first years. Even when cultivation was done in 50- to 100-m. strips transversely to the prevailing wind, with wide strips of heather in between, damage continued except where the site had previously been sown to *Waldstaudenroggen* (a biennial variety of rye), or until lupins had been grown between the rows. Both rye and lupins had the additional advantage of forming a protection against deer damage. Strips were later reduced to a width of 20–30 m., with a furrow down the middle to catch the drifting sand. Pines were found to be attacked by a heather weevil, *Strophosomus limbatus*, but Multanin 50 gave good control if applied early. Methods of cultivation, planting, fertilizing equipment, and costs, are described.

393. CONWAY, M. J. **Mechanisation in sand dune afforestation.** *Emp. For. Rev.* 35 (2), 1956 (142–8). 3 refs.

New Zealand's economy is based on its agricultural and pastoral industries, but its exotic forest estate is assuming increasing importance. The area of drifting sand, although only 0·4% of the total land

area reaches 4% in certain districts. Policy for the sand-dune country and measures taken to implement it are explained. There are at present four projects based on establishing permanent cover on the foredunes, using marram grass and yellow lupins. Slow progress was made by manual means, so mechanization was sanctioned in 1953. The relative efficiency of the two methods is compared and the development of planting machines adapted to the particular purpose is described. The likely difficulties to be encountered receive mention and the savings, of the order of 50%, that can be effected, are stressed. An appendix quoted from the N.Z.F.S. Annual Report 1954–55 gives information on the four projects now in hand. *From author's summary.*

394. ZOHARY, M., and WEISEL, Y. **The ecology of non-irrigated cultivated forest trees.** *La-Yaaran* 6 (3/4), 1956 (4–7, 32–3). [Heb.e.]

Sand dunes, loess, sandy loess and fluviatile loess are the characteristic soils of the northern Negev. The first two, with ca. 120 mm. annual rainfall, have sufficient water to maintain widely spaced trees, *Eucalyptus rostrata, Pinus halepensis, Amygdalus communis, Tamarix aphylla, T. gallica, Olea europaea* and *Punica granatum* being the most successful. Among the widely variable first 3 species it is assumed that there are drought-resistant strains which may thrive without irrigation, and these strains are to be selected. *From authors' summary.*

395. YANKOVITCH, T. Particularités du repeuplement des terrains torrentiels: principes et procédés. **[The peculiar problems of afforestation of land subject to devastation by torrents: principles and methods.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/101, 1956. pp. 7. 19 refs. [F.]

396. **[Erosion in the province of Kielce.]** *Sylwan* 100*B* (4), 1956 (33–71). 14 refs. [Pol.]

A scientific and technical conference on soil erosion in the province was held at Kielce on 10–11 Oct., 1955. The three main papers read at the conference (and here published in full) are: (1) The effect of afforestation and tree-planting on water-erosion in Kielce province (*A. Reniger*); (2) Attempts at checking erosion on peasant farms and farm forests in the Kielce province (*T. Trzebski*), and (3) Afforestation of, and tree-planting in, the eroded areas of Kielce province (*T. Zieliński*).

397. RAY, P. K. **Afforestation of alluvial waste lands in the Nadia district (West Bengal).** *Indian For.* 82 (8), 1956 (399–402 + 4 photos).

Notes on methods and costs and choice of species (for fuel, timber etc.).

398. HUNT, K. **Kenya's forest department clothes bare hills.** *Emp. For. Rev.* 35 (3), 1956 (313–6).

A first report on results from the *gradoni* system of terracing, introduced in April 1955 on the badly eroded W. slopes of the Mbololo Range. Pine and other seedlings, in most cases sown direct, were well established after 3 months. By the end of 1955, 38 miles of terracing had been constructed in co-operation between the Forest and Agricultural Departments.

399. KERFOOT, O. **An example of the successful regeneration of *Eucalyptus* in the dry savannah of Africa.** *Emp. For. Rev.* 35 (2), 1956 (184–92). 13 refs.

The history behind the establishment of *Eucalyptus* in North-East Rhodesia is described, including the basis of early methods and current practice, viz. the native 'Chitmene' method of agriculture, which involves the cutting, stacking and burning of indigenous bush, and the sowing of seed in the resultant ash. Advantages and disadvantages of the modified technique are discussed, together with the possible effects of both fire and ash on the soil complex. Some suggestions are made as to the possible application of the method in comparable areas of Central and East Africa where difficulties have been experienced in establishing exotic species by natural regeneration or other means. *From author's summary.*

400. GOOR, A. Y. Informe al Gobierno de Chile sobre repoblación forestal y rehabilitación de la zona árida del Norte. **[Report to the Government of Chile on the afforestation and rehabilitation of the arid zone of the North.]** FAO, Rome. *FAO/ETAP* No. 500, 1956. pp. 29 + 5 maps, 6 photos. 14 refs. [Span.]

401. PARADISO, D. M. La reforestación del Altiplano. **[The afforestation of high plateaux.]** *Bol. for. Serv. for. Bolivia* No. 1, 1956 (89–94). [Span.]

Native species most suitable for afforestation in the high Andean plateaux are: Kheñua (*Polylepis tarapacana*), Kishuara [*Buddleia incana*] and Kholly [?]. Short notes are given on methods of collecting seed, raising from seed or cuttings, and transplanting.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 282, 299, 315, 317, 392.

402. HILEY, W. E. **Underplanting of Japanese Larch.** *Quart. J. For.* 50 (3), 1956 (189–96 + 2 photos). 5 refs.

A 7·9-acre stand of Japanese Larch, 25 years old, has been thinned to 50 trees per acre and underplanted. The thinning has removed 1203 Hoppus ft. o.b./acre, leaving 474 H.ft./acre. The remaining trees average 56·4 ft. in height, are nearly clear of branches to 30 ft., and have a q.g.b.h. of 7·1 in. It is estimated that, after allowing for all expenses and overhead charges, the net income from previous thinnings has been £41. 8*s.* and from this thinning £147/acre. Calculations suggest that, allowing present costs of planting, brashing, and annual maintenance, a financial yield of 6·1% would have been earned if the stand had been clear-felled at 25 years. Evidence is advanced, however, to show that if the remaining trees grow satisfactorily they are likely to earn a higher rate of interest than this if

left for another 25 years. The treatment creates a two-storeyed high forest. The silvicultural implications of this system are discussed. *From author's summary.*

403. DEITSCHMAN, G. H. **Growth of underplanted hardwoods in Black Locust and Shortleaf Pine plantations.** *Sta. Note Cent. St. For. Exp. Sta.* No. 94, 1956. pp. 2. 1 ref.

Replicated plots with rows of 7 different underplanted hardwood species were established in S. Illinois in 1947 in 8- to 9-year-old Shortleaf Pine (*a*) and Black Locust (*b*) plantations [cf. *F.A.* 12 No. 1962]. After 8 years, underplanted trees in (*b*) were 2–3 times taller than in (*a*), with Tulip Tree and Black Walnut showing the best height growth (15·4–16·7 ft.) though drought in the last 2 years halved their growth rate and killed 38% of the Tulip trees. Cottonwood alone failed completely under both overstoreys. Sweetgum (6·6 ft.) and Tulip Tree (6·0 ft.) grew best in (*a*) though the latter only grew satisfactorily on the lower slopes. Results are tabulated.

404. KRAHL-URBAN, J. Unterbau von Eichenbeständen. **[Underplanting of Oak stands.]** *Forstarchiv* 25 (5), 1954 (105–9). [G.g.]

To produce high-quality veneer, the author recommends underplanting *Quercus sessiliflora* with Beech, and *Q. robur* with Hornbeam and Lime, when 30–50 years old.

405. GALOUX, A. Contribution à l'étude des boisements mélangés par bouquets: l'expérience Nismes-Gnonry. **[Group mixtures: the Nismes-Gnonry experiment.]** *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 18, 1955. pp. 23. 6 refs. [F.]

Describes the establishment and development of an experimental plantation begun in 1890 on a calcareous pasture. The original plantations consisted of some large groups of *Quercus rubra*, small stands of stem-by-stem mixtures of *Q. rubra*, *Q. robur*, *Q. sessiliflora*, *Acer pseudoplatanus*, *Fraxinus excelsior*, *Pinus sylvestris* and *Larix decidua*, and groups of *Pseudotsuga taxifolia* and *Abies alba* with a few individual broadleaved trees. The plantation was later enriched by pure groups of conifers (*P. taxifolia*, *A. alba* and *A. grandis*). Successive inventories are discussed and analysed. The present stand is an uneven-aged mixture of conifers and broadleaved species, with some pure groups, approximating to a normal selection forest. The conclusions drawn from the experiment are as follows: Group mixtures are more satisfactory than stem-by-stem mixtures, which often produce trees of bad form. The use of species giving abundant natural regeneration (e.g. *Q. rubra*, *A. pseudoplatanus*) is highly desirable. A high % of light-demanding species is not only indispensable for successful establishment in the first place, but permits the later introduction of shade-lovers well before the former have reached the age of exploitation, thus enabling even-aged stands to develop rapidly in the direction of uneven-aged selection forest. From the economic point of view it is desirable that broadleaved species should form $< 40\%$, this proportion being reached gradually by favouring their natural regeneration under conifers. In the stand at Nismes-Gnonry the proportions at 50–60 years are 55% broadleaved and 45% conifers, giving an annual increment over the decade of 7–8 cu.m./ha.; this is somewhat deficient in large sawtimber, but approximates to the theoretical increment of a normal selection forest on such a site.

406. BURGOS L., J. A. Posibilidades de la repoblación natural y semiartificial del tornillo, *Cedrelinga catenaeformis* Ducke, en Tingo Maria. **[Possibilities of natural and semi-artificial regeneration of *C. catenaeformis* in Tingo María.]** *Boletín trimestral de Experimentación agropecuaria, Lima* 4 (3), 1955 (7–9). [Span.]

In November 1950, 4 strips, 5 m. wide, ca. 200m. long and 15 m. apart, were opened in a roughly E.-W. direction in climax forest on a steep slope N.E. of the Tingo Maria Experiment Station. In the strips, wildings of *Cedrelinga catenaeformis* and *Swietenia macrophylla* were ball-planted at spacings of roughly 4 m. The land surrounding the openings supported a few medium-sized *C. catenaeformis*. From the first year onwards the *C. catenaeformis* throve, whereas *S. macrophylla* had practically disappeared by the second or third year. Naturally regenerated plants of *C. catenaeformis* also appeared in the strips. Measurements of 6-year-old trees, both the planted wildings and the natural regeneration, showed satisfactory development. Complete elimination of species having no commercial value, leaving largely *C. catenaeformis* on a plot 50 × 25 m., did not, however, induce natural regeneration of *C. catenaeformis*.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)

See Nos. 304, 306, 380, 391, 558.

237. Amelioration of Forest Sites

See also Nos. 18, 29, 439, 526–7, 546, 548.

407. WOODS, F. W., HEBB, E. A., and FASSNACHT, D. L. **Mulch not beneficial to seedlings on deep sands.** *J. For.* 54 (9), 1956 (595).

Four blocks each of mulched and unmulched plots were established on well drained sands of low water-storage capacity on the Chipola Experimental Forest, Florida. Longleaf Pine needles were applied 2 in. deep for a radius of 18 in. round selected seedlings of *Pinus palustris* and *P. elliottii*. Surface temperatures of the sand reached 143° F. and inside the mulch temperatures exceeded 160°. Survival of unmulched seedlings was a little better than that of mulched. Mulching did not increase soil moisture and is not recommended for sandy sites.

408. Arbeitsplan für die Anlegung von Forstdüngungsversuchen. **[Working instructions for fertilizer trials in forestry.]** *Allg. Forst- u. Jagdztg.* 126 (4), 1955 (81–7). [G.]

The instructions, adopted by the Yield Studies group of the Union of German Forest Research

Organizations at Schleswig, 1954, lay down directives for selection of sites and stands, size and lay-out of plots, combinations, composition and quantities of fertilizers and their description, soil analyses, general treatment, evaluation and statistical analysis.

409. GAMBI, G. Considerazioni sull' impiego di metodi statistici nella sperimentazione forestale. **[The use of statistical method in forestry research.]** *Monti e Boschi* 7 (8), 1956 (374–81). [It.f.e.]

After a brief general discussion, the author illustrates the subject by an account of the use of statistical method in an experimental study of the efficacy of fertilizers, broadcast or dug in, applied to a Poplar plantation. [Cf. *F.A.* 17 No. 405.]

410. KROLIKOWSKI, L. **Influence of a single application of mineral fertilizer in the cultivation of Pine trees in the chief forest districts: Bartel Wielki and Wanda [Poland].** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *D*, 1956 (291–304). 10 refs. [E.g.f.]

Single applications of various combinations of N, P and K, and of Ca were made to 2-year-old Pine plantations on sandy soil. Measurements after 3 and 12 years showed that K, in the combinations KPN, KN and KP, and Ca caused an increase in height and diameter increment, and in weight, length and number of needles, as compared with controls. Treatment with PN fertilizer, however, reduced height and diameter compared with the controls.

411. RICHARDS, B. N. **The effect of phosphate on Slash and Loblolly Pine in Queensland.** In *Res. Notes Qd. For. Serv.* No. 5, 1956. pp. i + 11. 5 refs.

Fused-needle disease of *P. taeda* and *P. elliottii* in Queensland can be corrected by the application of phosphatic fertilizers. A minimum total P_2O_5 content of 135 p.p.m. in the surface soil is required for healthy growth of *P. taeda* and about 110 p.p.m. for *P. elliottii*. Where P is deficient, growth of plantations is slow, and financial yields are much delayed or, in extreme cases, practically non-existent. The optimum phosphate content of the surface soil appears to be about 210 p.p.m. for *P. taeda*, and perhaps 150 p.p.m. for *P. elliottii*. Finely ground rock phosphate (*a*) is as efficient as superphosphate (*b*) in reducing the incidence of fused needle and stimulating growth. Initial response to both fertilizers occurs in the same year but is not as great with (*a*) as with (*b*); (*a*) has the advantage of possessing approximately double the P_2O_5 content of (*b*). Broadcast applications are preferable in older plantations, but when treatment is applied at planting, application to the individual trees appears to be satisfactory. It is estimated that the future annual requirement of Queensland forestry for rock phosphate is of the order of 225 tons. *From author's summary.*

412. ANTIPOV-KARATAEV, I. N., and SABO, E. JU. Limannoe orošenie drevesnyh nasaždeniĭ i melioracija soloncovyh zemelj v podzone svetlokaštanovyh počv. **[Spring-flood irrigation of tree plantations and the improvement of solonets soils in the sub-zone of light chestnut soils.]** Izdateljstvo Akademii Nauk, Moscow. 1953. pp. 127. 22 refs. [Russ.]

Includes chapters on the water regime of light chestnut and solonets soils and its improvement; the improvement of solonets soils by cultivation and agricultural cropping; irrigation of tree plantations once annually by intercepting and spreading spring run-off from melting snow or heavy showers; systems of dykes and trenches recommended for irrigation in the south of Stalingrad province, and a description of an experiment in spring-flood irrigation carried out there. Engineering details are discussed, with diagrams.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 161–3, 280–1, 332–3, 409, 442, 1203, 1217.

413. RETTELBACH. Bayern und die Pappel. **[The Poplar in Bavaria.]** *Holz-Zbl.* 82 (83), 1956 (1033–4). [G.]

A report on the annual conference of the German Poplar Society, including data on potential sites and actual plantings, a paper (*Krembs*) on Grey Poplars in the Danubian bottomlands, describing the Ingolstadt Grey Poplar, a *P. tremula* × *P. alba* hybrid, site conditions, regeneration, diseases, etc.; also on afforestation with Poplars and other spp. on waste land (dismantled munitions factory and rubble mounds).

24. Tending of Stands and Trees

414. DRAGIŠIĆ, P. Problem razvitka i njege mladih sastojina bukve i hrasta kitnjaka u NR Hrvatskoj. **[The problem of the development and tending of young stands of *Fagus sylvatica* and *Quercus sessiliflora* in Croatia.]** *Šum. List* 79 (11/12), 1955 (374–95). [Croat.g.]

As much as 230,000 ha. of forest land in Croatia is now under young Beech and Oak stands in the 1-to-30-year age-class. Most are either untended or tended by untrained personnel. From samplings of representative, untended natural stands in various parts of Croatia, the following data are tabulated: (1) survival of Beech seedlings during the first 24 months; (2) average number of 2-year Beech seedlings per ha. on different sites; (3) height-classes of young Beech forest; (4) height-class analyses and crown condition of 7-year Beech, the latter based on the apical bud; (5) similar analyses of 3-year Oak and 9-year Beech stands, before and after thinning out; (6) relationship between d.b.h. and height in an Oak stand; (7) crown-class representation in stagnating stands, 14 predominantly Beech, 2 predominantly Hornbeam, 1 predominantly Oak. The analyses showed that most of the young stands require systematic tending; but considerations of cost limit this to the removal of the most undesirable advance growth and other stems.

241. Cleaning

See No. 380.

242. Thinnings

See also Nos. 488, 533, 690, 758, 788, 1003.

415. LEIBUNDGUT, H. Wesentliche Gesichtspunkte für die Durchführung von Durchforstungsversuchen. **[Essential viewpoints for the execution of thinning experiments.]** *Proc. 11th Congr. int. Union For. Res. Organ., Rome 1953*, 1954 (611–7). 5 refs. [G.]

Discusses the main problems on which thinning research is now focussed, and makes proposals for the uniform description of stand structure, a system of tree classes, and the characterization of thinning treatments. The system of tree classes proposed takes the form of two three-figure numbers. In the first of these, the first figure denotes 3 sociological positions (upper, middle and lower storey); the second, vigour; and the third, 'dynamic tendency' i.e. whether the tree is likely to improve, remain in, or lose its position. The second set distinguishes silvicultural criteria. The first figure denotes whether a tree is a main-crop tree, a harmless or a harmful inferior tree; the second, stem form (prospective % of high-grade timber etc.); and the third, crown quality. [Cf. *F.A.* 18 No. 295.]

416. OLBERG, A. Über die Kennzeichnung der Durchforstungsweise. **[On the characterization of thinning measures.]** *Allg. Forst- u. Jagdztg.* 125 (2) 1953 (55–7). 2 refs. [G.e.]

Proposes a system of fractional notation (fellings over residual stand), using, for the kind of thinning, the author's tree classes [see *F.A.* 16 No. 1585; 18 No. 294] and, for the grade, (*a*) felled/residual volumes per ha., and (*b*) % volume felled/residual volume in % of 'standard' stocking (the 'standard' being a figure for light thinning taken from a suitable yield table). A few examples are given, and modifications for special cases and the limitations of the system are discussed.

417. CROSSLEY, D. I. **The chemical control of density in young stagnating stands of Lodgepole Pine.** *Tech. Note For. Br. Can.* No. 39, 1956. pp. 17. 1 ref.

At the Kananaskis Forest Experiment Station, Alberta, various concentrations of 2,4-D ester, and Ammate were tested for thinning dense stands of 14-year-old *Pinus contorta* with an understorey of *Picea glauca*. Spraying was done in spring and summer, a total of 276 milliacres being treated. The most effective concentrations were: 2 gal. of 2,4-D in 25 gal. of diesel oil and 75 gal. of water (96% mortality after 3 years) and 1 gal. of 2,4-D in 100 gal. of diesel oil (91% mortality). Except in the case of Ammate and water treatments, where summer application significantly increased mortality, the date of treatment did not greatly affect results. Spruce mortality was considerably less than that of Pine.

418. FOILES, M. W. **Thinning from below in a 60-year-old Western White Pine stand.** *Res. Note Intermt. For. Range Exp. Sta.* No. 19, 1955. pp. 6.

Thirty-year results from a test of light, moderate and heavy thinning in a stand in the Priest River Experimental Forest, Idaho, indicate that thinning does not appreciably change the total volume growth but that it increases diameter increment and improves species composition, especially on heavily thinned plots.

419. GAINES, E. M., and KOTOK, E. S. **Thinning Ponderosa Pine in the southwest.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 17, 1954. pp. 20 + 2 photos. 10 refs.

Reviews earlier studies in dense young stands and gives some salient results. In general, thinning accelerates diameter growth but hardly changes b.a. or, in pole stands, height growth; in dense sapling stands (12 and 20 years old) height increment was, in general, proportional to the heaviness of the thinning. An idealized thinning regime is presented, with a diagram, and recommendations made on when and how to thin in the light of market prospects.

420. SCHANTZ-HANSEN, T. **Twenty-five year summary of Red Pine thinning plots.** *J. For.* 54 (8), 1956 (512–4). 7 refs.

Incorporates all basic data previously reported [cf. *F.A.* 11 No. 329] with the latest measurements. Results are discussed. Comparison with Eyre and Zehngraff's yield tables for unmanaged Red Pine at 40 years indicates that all but the 9 × 9 plot need further thinnings; stands at densities of ⩾ 1400 trees/acres show signs of stagnation while stands with 500–800 trees/acre are still accelerating in growth.

421. CLARK, F. B. **Growth of Shortleaf Pine after thinning.** *Sta. Note Cent. St. For. Exp. Sta.* No. 93, 1956. pp. 2.

[Cf. *F.A.* 15 No. 1353.] Results after 5 years show little difference in b.a. and d.b.h. increments between unthinned controls and plots thinned to different intensities. Further research is needed to determine when, and how severely, young stands should be thinned.

422. RICHARDS, B. N. **The development of thinning schedules for plantations of Slash and Loblolly Pine in Queensland.** *Res. Notes Qd. For. Serv.* No. 3 [*n.d.*] pp. iii + 43 + 5 gphs. 19 refs.

Illustrates the experimental basis for thinning schedules in plantations of *Pinus elliottii* and *P. taeda* in Queensland. Concentration on production of high-grade lumber has necessitated early pruning of elite trees and fostered thinning techniques aimed at favouring these 'select' stems. A method is described for analysing experimental results on the basis of clear and knotty wood production. Competition among the components of a stand commences at a very early age; dominants are affected as well as other crown classes. At any particular age there is a wide range in density of stocking, expressed as the number of stems per acre, capable of producing near-maximum merchantable volume increment. If stands are held at or below the lower end of this range, select stems benefit greatly, while little total merchantable wood is lost. A merchantable thinning to 350 stems/acre is necessary in

8 × 8 ft. stands at 12–15 years. A similar thinning is desirable in 7 × 7 ft. stands, but, because of lesser girth development, thinning only to 450/acre on a merchantable basis is possible at 13–16 years. In both cases, a second thinning to 240/acre is required 5–6 years later. Delayed thinnings have an adverse effect on the increment of select stems and to obviate this an unmerchantable thinning to about 450/acre at 4 years of age is recommended. An approach to control of thinning grade through basal area is discussed. Current first thinnings reduce the stand to ca. 90 sq. ft./acre; the second aims at leaving 95–100 sq. ft. *From author's summary.*

423. STAEBLER, G. R. **Effect of controlled release on growth of individual Douglas Fir trees.** *J. For.* 54 (9), 1956 (567–8).

In a 41-year-old, site-IV stand of Douglas at the Wind River Experimental Forest, Washington, in 1952, a one-chain grid was laid out and at each grid point a dominant, co-dominant or intermediate tree was selected. Ten such trees of each crown class were subjected to 4 thinning treatments, viz. 0, 1, 2 or 3 competitors were felled (involving 120 trees in all). Average diameter growth, measured after 3 years, showed that all the dominants had grown more than the co-dominants, and that their growth rate had increased progressively from the controls (0·69 in.) to 3 competitors felled (1·05 in.). In other crown classes, although the controls had grown least, the best growth of co-dominants was with 1 competitor felled, and of intermediates—with 2 competitors felled.

424. MARION, J. Définition des éclaircies et problèmes à étudier lors de leur exécution dans les suberaies marocaines de l'étage semi-aride. **[Characterization of thinnings and problems to be studied during thinning experiments in the Moroccan Cork Oak forests of the semi-arid zone.]** *Proc. 11th Congr. int. Union For. Res. Organ., Rome 1953*, 1954 (617–25). [F.]

Stresses the complexity of the problems, involving questions of wood and cork production, vigour (resistance to climatic hazards), development of the soil and the ground flora, and regeneration.

425. HENRY, N. B. **Progress report on thinning in even-aged Blackbutt (*Eucalyptus pilularis*).** *Res. Notes Qd. For. Serv.* No. 2 [*n.d.*] pp. 18 + 9 tbls., 8 gphs., 1 plate.

Three thinning experiments covering a range of spacing from 10 × 10 ft. to 25 × 25 ft. are described, and details of girths, b.a., and volume set out up to age 31; c.a.i./m.a.i. curves are drawn up, and indicate that m.a.i. is likely to culminate shortly in all spacings. Value of standing stock and value increment for the last 4 years are derived. Maximum value production is associated with spacings somewhat wider than those included in the experiments.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also No. 770.

426. CONOVER, D. F. **Harvesting chemical wood and pulpwood more than doubles usual yields from improvement cutting in second-growth northern hardwoods.** *Tech. Note Lake St. For. Exp. Sta.* No. 459, 1956. pp. 2.

A 20-acre improvement felling in the Argonne Experimental Forest, Wis., yielded a total of 612 cu. ft., of which 320 cu. ft. was of hardwood pulp- and chemical wood, and 292 cu. ft. of sawtimber and conifer pulpwood.

427. BARNARD, R. C. **Frill-girdling.** *Emp. For. Rev.* 35 (3), 1956 (317–9).

A method of frill-girdling observed in Malaya requires less labour than the East and West African methods and is equally suitable for poison applications of Na arsenite in water or arboricides in oil. The frill girdle is made as horizontal as possible at a convenient height, with a light short-handled axe, with single overlapping cuts, 45° from the vertical, and just reaching into the sapwood. For species with copious latex, the cuts are deeper, and 2 cuts, one ½ in. above the other, are made to form a wider channel. The solution is poured in all round the frill and it is unnecessary to repeat the application. The kill in Malaya, using 2 lb. Na arsenite/1 gal. of water, averages 90% within a year after treatment.

428. CARVELL, K. L. **The use of chemicals in controlling forest stand composition in the Duke Forest.** *J. For.* 54 (8), 1956 (525–30).

A time and cost study was made on a 24-acre hardwood area (including *Carya*, *Quercus* and *Fraxinus* spp., *Fagus grandifolia*, *Cornus florida* and *Nyssa sylvatica*) to compare frilling, making 'cups' at ground level and at ca. 4 ft., and simple girdling. Making cups was 1·4 to 1·7 times as expensive as the other methods; frilling becomes progressively cheaper than girdling with diameters > 12 in. and eliminates large sprouting. Cups are too expensive for large-scale work, take more time than frilling, and require much more poison per tree. Frilling (especially in early spring) and cups at ground level gave the highest kill.

429. ATKINS, E. S. **The use of chemicals to release White Pine reproduction.** *Tech. Note For. Br. Can.* No. 37, 1956. pp. 8. 7 refs.

At Petawawa, Ontario, four herbicides, Dow Formula 40 (2,4-D amine), Esteron 44 (2,4-D ester), Esteron 245 (2,4,5-T) and Esteron Brush Killer (2, 4-D + 2,4,5-T) were sprayed to dripping point in concentrations of 1, 3 and 5 thousand p.p.m. on an underbrush of Hazel, Aspen and Pine, in 24 milliacre quadrats. All proved equally effective. Hazel and Aspen were killed completely by the 1000 and 3000 p.p.m. concentrations whereas Pine was only partially affected by the 5000 p.p.m. Aspen stumps were also sprayed with high concentrations of Esteron 245 and Esteron Brush Killer in diesel oil, but the treatment was unsuccessful, possibly because of a time lapse between felling and spraying.

430. ATKINS, E. S. **Susceptibility of certain trees of Eastern Ontario to basal bark sprays.** *Tech. Note For. Br. Can.* No. 38, 1956. pp. 5. 1 ref.

At Petawawa, Ontario, Esteron 245 (2,4,5-T) and Esteron Brush Killer (2,4-D + 2,4,5-T) at 1 pint/3 gal. diesel oil were sprayed on the basal 18 in. of 6

mature trees of each of various species. The experiment was carried out twice, in Aug. 1951 and April 1952. Both sprays proved equally effective both times. Species killed or severely affected were *Populus tremuloides*, *Acer saccharum*, *A. rubrum*, *Abies balsamea* and *Quercus rubra* (killed by April application, severely affected by August application). Species largely or wholly unaffected were *Pinus strobus*, *Betula papyrifera*, and *B. lutea*.

431. MATSUI, Z., and SHINOHARA, H. **[The efficacy of chemical weed killers on each deciduous stem.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (94–102). 8 refs. [Jap.e.]

In tests for the control of hardwoods suppressing *Abies mayriana*, regeneration, standard doses of (*a*) NH_4 sulphamate (2·8 g.), (*b*) 2,4-D (1·5 g.) and (*c*) $KClO_3$ (6 g.) were inserted dry in basal frill cuts (2–4 per tree, at 10-cm. intervals). Mortality % from (*a*), (*b*) and (*c*) was 63·3, 44·4 and 15·6 respectively.

432. REYNOLDS, R. R. **Upland hardwoods in South Arkansas Pine stands—aerial or underground fifth column?** *J. For.* 54 (9), 1956 (585–6).

In the Crossett Experimental Forest, a 5-acre area with a Pine overstorey varying from 3000 to 5000 bd. ft./acre and a dense understorey of hardwoods was chosen for experiments. In 1951 all hardwoods $\geq$ 3·5 in. d.b.h. on and within 800 ft. of the area were girdled. In four $\frac{1}{4}$-acre plots, hardwoods of 1–3·5 in. diam. were also felled and treated with Ammate. Plants of $<$ 1 in. diam. were sprayed with Ammate in water. Examination after 3 years of a $\frac{1}{10}$-acre centre plot in each area revealed a total of 308 live stems (770/acre), all except one coming from old rootstocks and root systems, some ca. 50 years old. To control hardwood brush, methods should be chosen by which the rootstocks as well as the stems above ground are killed.

433. MCQUILKIN, W. E. **Use Ammate in notches for deadening trees only during the growing season.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 52, 1955. pp. 2. 2 refs.

In Pocona Experimental Forest, Pa., 12 Beech and 12 Red Maples were notch-girdled and treated with Ammate in July 1952 (*a*). Similar sets of trees were treated in September (*b*), and November (*c*). After 2 growing seasons all the Beech and 11 of the Maples in (*a*) were dead or severely injured, all of both species in (*b*), but only 8 and 2 respectively in (*c*).

245. Tending of Trees, Pruning etc.

See also Nos. 543, 1008.

434. SMITH, J. H. G. **An example of the importance of change in form class to calculations of clear-wood growth.** *For. Chron.* 32 (2), 1956 (260–2). 4 refs.

The common assumption of a constant Girard form class of 0·80 when calculating potential profit from pruning Douglas Fir, produces an under-estimate. The size of this under-estimate was assessed by stem analysis of 9 trees (mensurational data tabulated) which showed that a significant but highly variable improvement in form class is to be expected in natural stands, and that this improvement is slightly accelerated in pruned stands.

435. SMITH, J. H. G. **Even 75-year-old Fir can be pruned for profit.** *B.C. Lumberm.* 40 (7), 1956 (24, 28). 6 refs.

Advocates pruning to 19 ft. with a 13-ft. aluminium pole-saw in 75-year stands of Douglas Fir, since little clear wood will be produced naturally in the next 30 years in such stands. The cost of pruning is nominal and a high price for clear veneer logs is likely.

436. RALSTON, R. A., and LEMIEN, W. **Pruning Pine plantations in Michigan.** *Circ. Bull. Mich. agric. Exp. Sta.* No. 221, 1956. pp. 27.

Gives detailed recommendations for pruning plantation-grown *Pinus resinosa*, *P. strobus*, *P. banksiana* and *P. sylvestris*.

437. LÜCKHOFF, H. A. **High pruning in *Pinus patula*, its feasibility, effect on growth and economics.** *J. S. Afr. For. Ass.* No. 27, 1956 (55–71). 1 ref. [E.e.afrik.]

[Cf. *F.A.* 16 No. 4089.] Compares the results of (*a*) pruning in one operation to 22 ft. when mean height is 42 ft. (normal practice); (*b*) pruning in 2 operations first to 22 ft., and then to 29 when 50 ft. high; (*c*) to 22 ft., and then to 36 when 55 ft. high; and (*d*) to 15 ft., and then to 29 when 50 ft. high. Method (*c*), feasible with 24-ft. ladders, is preferred and has a negligible effect on growth. Extra production of clear timber is doubtful but the elimination of defective knots in an extra 20% of the timber volume results in a value increase outweighing pruning costs. These and the labour performance are detailed. In closely whorled species (*P. taeda* and *P. caribaea*) such high pruning is worth a trial. It is probably impracticable in *P. pseudostrobus* and *P. radiata*, which are more difficult to climb.

438. WINTERFELD, K. **[Untersuchungen über die Auswirkung der Grünästung bei der Rotbuche.] I. Beeinflussung des lebenden Holzgewebes durch den Grünästungsschnitt bei der Rotbuche. II. Holzzerstörungen durch Pilzbefall an Grünästungswunden der Rotbuche. III. Kann die Grünästung der Rotbuche die Rohholzqualität verbessern? [The effect of green pruning on Beech. I. The effect of the pruning cut on live woody tissue. II. Decay through fungal infection of pruning wounds. III. Can green pruning improve the quality of Beech wood?]** *Holz-Zbl.* 82 (84; 87; 90), 1956 (1053 . . . 1056; 1089–90; 1115–7). 49 refs. [G.g.]

Gives the main findings from a study based on the pruning of 135 72-year-old Beeches in 1939–40 and an evaluation 12 years later. The drying process following pruning started in the early-wood vessels. When the cut had severed rings in the stem, lines of drier wood which later showed discoloration and tylose formation, could be observed up and down the stem. The demarcation tissue formed behind the wound showed weaker tylosing and deposition of gummous substance than similar tissue behind a dead branch before shedding. Callus formation and healing time varied with the season of pruning, skilfulness of the cut, weather and exposure,

shape and size of wound, and vigour of the tree. In dominants, wounds 3 cm. in diameter took an average of 7 years for complete occlusion, i.e. ca. half as long as the scars of naturally shed branches. Once the wound was completely occluded, fungal infection, which was always present, ceased to progress inwards. The progress of wood-destroying fungi was sometimes halted by the demarcation zone; fungi were sometimes isolated from the brown zone behind it, but discoloration cannot be equated with fungal infection. No significant differences in infection were found with regard to season of pruning and protective coatings used, except that spring pruning encouraged, and many coatings by their corrosive action hindered, early callus growth. In general, areas affected by rot and discoloration after skilful pruning of branches up to 3 cm. in diameter, were found to be no greater than after comparable natural branch-shedding, though their extent varied considerably in different trees, depending on branching habit, vigour, and individual resistance to fungal attack. Such pruning could therefore be beneficial. The need to develop a wound dressing that is weather-resistant and not harmful to the cambium is stressed, no such preparation being known to the author.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and Their Treatment

See also No. 412.

439. Voprosy vyraščivanija zaščitnyh lesnyh nasaždeniĭ. **[Problems in the raising of protective forest plantations.]** *Opyty i Issledovanija, Vsesojuznyĭ Naučno-issledovateljskiĭ Institut Agrolesomelioracii, Moskva* No. 25, 1954. pp. 214 + 1 map. [Russ.]

Includes articles on: Silviculture on irrigated lands (*V. V. Lebedev*); Raising woods on solonets and solonets-like soils (*L. T. Zemljanickiĭ*); The sowing and planting of *Caragana arborescens* in ravine-side belts (*I. D. Braude*); The establishment of seed plantations of tree and shrub species (*N. K. Vehov*); Preparation of *Fraxinus excelsior* seed for sowing (*D. D. Minin*); Conditions of acorn transport and storage (*Z. K. Šumilina*); and The breeding of new trees and shrubs (*A. V. Aljbenskiĭ*).

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

440. JÄHRIG. Aus Haubergen wird Hochwald. **[From coppice with field crops to high forest.]** *Holz-Zbl.* 82 (79), 1956 (989–90). [G.]

Describes conversion work now in progress in the Siegerland 'Hauberge', traditionally managed in common ownership as coppice with agricultural intercropping. It is planned to convert 500 to 800 ha. a year, the final forest to be ca. 60% Spruce, 30% broadleaved species, and 10% other conifers.

441. GEORTAY, G. Données de base pour la gestion de paysannats de cultures vivrières en région équatoriale forestière. **[Fundamental factors in the management of small holdings producing food crops in the equatorial forest region.]** *Bull. Inform. Inst. nat. Étude agron. Congo belge* 5 (4), 1956 (219–36). [F.]

Includes tables of the man-day requirement for all operations and all crops. Two tables cover the labour requirement separately for cutting undergrowth, felling, 3 pilings and burnings, separately for forest, regrowth and the *parasoleraie* (secondary *Musanga*) and the distribution of this labour month by month.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

442. KIRWALD, E. Waldwirtschaft an Gewässern. **[Forestry along [running or stagnant] waters.]** Wirtschafts- und Forstverlag Euting KG., Neuwied/Rhein. *1956.* pp. 147. 16 refs. [G.]

Deals chiefly with the use of trees and shrubs for protection, amenity and timber production on river banks, lake sides etc. and discusses hydrological, engineering, and silvicultural aspects, such as choice of species and system (preferably coppice or mixed, storeyed high forests), establishment, treatment, and utilization. Stress is laid on the importance of coppicing species to form 'brushes' along the water's edge and round tree stems in the zone of periodic flooding. [Cf. *F.A.* 14 No. 3010.]

266. Shelterbelts, Windbreaks

443. CHAMPION, SIR H. G. **Shelterbelts and their effects.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/11/1 *A*, 1956. pp. 3.

Summarizes the present state of research and indicates subjects for future study.

444. POPESCU, C. I. Condiţiile de instalare a perdelelor forestiere de protecţie a cîmpului în Oltenia. **[Conditions for establishing shelterbelts to protect field crops in Oltenia.]** Editura Academiei Republicii Populare Romîne, Bucarest. 1954. pp. 212. 92 refs. [Rum.]

A detailed study of the problems presented by conditions in this steppe area, including observations on root systems etc. in existing shelterbelts.

445. NÄGELI, W. Le problème de la protection contre les vents, son application en Israel. **[Protection against wind: its applications in Israel.]** *La-Yaaran* 6 (1/2), 1956 (5–14, 36–28). [Heb.f.]

Most of this lecture is devoted to a summary of the literature on shelterbelts, the rest dealing with examples in Israel and the local problems in the protection of plant and soil. Perennial crops are chiefly protected but the cost of the irrigation water required to maintain shelterbelts round annual crops would probably be more than balanced by their advantages. *Cupressus sempervirens* var. *pyramidalis* is most used, but the horizontal variety, in spite of its taking up more room, is far superior. Eucalypts are little used but with root pruning (as in California) they might be tried. Casuarina, Tamarisk and *Grevillea robusta* are also planted.

446. YUSSEM FAVRE, R. Cortinas forestales rompevientos (con referencia especial a la Región Central Pampeana). **[Shelterbelts—with particular**

reference to the central Pampas region.] *An. Adm. nac. Bosques, B. Aires* 1956 (31–43 + 9 plates). 6 refs. [Span.]

Recommends species suitable for shelterbelts and methods of establishing and tending them.

447. SMOLAŘ, V. Výzkum ochranných lesních pásů zkouškami v aerodynamickém tunelu. [**Research on forest shelterbelts by wind-tunnel tests.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (5), 1955 (635–60). 5 refs. [Cz.cz.russ.e.]

Presents the results of tests carried out in a wind tunnel of 60 cm. diam. on shelterbelt models (wire screens) of different permeability; the model height was 1·5 cm., the wind velocity (when unimpeded), 35 m./sec., and the Reynolds' number Re = 34,000. The coefficient of permeability was taken as the reciprocal value of the coefficient of aerodynamical resistance (drag), which was independently evaluated for each screen from the difference of pressures before and behind it when filling the whole cross-section of the tunnel. Four shelterbelt models were tested, whose porosity ratios (Σ mesh openings/area of screen) were, respectively, 0·675, 0·521, practically zero (the two preceding models placed 0·5 cm. apart), and zero (aluminium sheet). It was found that, whereas the impermeable shelterbelt had the maximum efficiency as far as reduction of wind velocity and pressure is concerned, its performance is accompanied by reverse flow which enhances evaporation; in order to prevent this effect, the coefficient of permeability should be $\leqslant 0{\cdot}07$, or the porosity ratio $\leqslant 0{\cdot}27$. These figures characterize the optimum permeability of shelterbelts (viz. an average reduction of wind velocity over a range equal to 35 shelterbelt heights amounting to 67·3%); it is, however, possible to increase the porosity ratio to 0·4 without substantially decreasing efficiency. In the shelterbelt porosity (p) range 0–0·4, the coefficient of permeability $f = p^2$.

448. NÄGELI, W. Über die Windschutzwirkung einer Allee mit astloser Bodenpartie. [**On the windbreak effect of tree rows having no branches near the ground.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/11/15, 1956. pp. 5 + 1 photo + 1 gph. 2 refs. [G.e.]

Two rows of Poplars, 24 m. high, spaced at 7 m. within and 14 m. between rows, pruned to 8 m. from the ground, had little effect on the velocity of head-on winds, at 1·5 m. above ground on the windward side. To the leeward, velocity even increased to 110% at tree height distance, but decreased considerably further away, though less than with belts of closed leafy profiles. *From author's summary.*

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 557 *et seq.*, 1162, 1186–8.

449. MATSUI, Z., YOKOYAMA, C., and MATSUZAKI, S. [**Sheep grazing in Ash and Alder forest.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (167–78). 13 refs. [Jap.e.]

A study was made of the carrying capacity of scattered bottomland forest (200 Ash and Alder trees /ha.) in which the ground cover consisted mainly of herbaceous plants and sedges. Green weight, frequency, palatability, and weights before and after grazing were measured, and nutritional value of the forage compared with forage grasses. The data (presented in tables with English captions) are based on experiments in grazing at a rate of 6 sheep/5 ares on fenced range for a period of 5 days.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also Nos. 133, 766.

450. GALOUX, A. Catalogue de l'Arboretum de Groenendaal. [**Catalogue of Groenendaal arboretum.**] *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 19, 1955. pp. 276 + 4 maps. 19 refs. [F.]

A detailed catalogue with more than 40 photographs.

451. CORNUZ, L. Arboretum et collections de l'École d'Horticulture de Châtelaine (Genève). [**The arboretum and collections of the Châtelaine School of Horticulture, Geneva.**] *Schweiz. Beitr. Dendrol.* No. 6, 1954 (1955), (12–6). [F.]

452. DEERING, R. B. **Effect of living shade on house temperature.** *J. For.* 54 (6), 1956 (399–400).

Graphs room temperatures for sites in California, (*a*) unshaded, (*b*) shaded in the afternoon, (*c*) shaded all day. The maxima of (*b*) and (*c*) were 20° F. less than that of (*a*). High-branching deciduous trees planted fairly close to the house on the E. and S. sides and low-branching trees planted to the W. and N.W. will provide cooling shade all day.

28. Husbandry of Forest Products Other than Wood

See also section 892.

281. Christmas Trees

453. **Tree farming can be a multi-product operation.** *Timberman* 57 (11), 1956 (58 . . . 63).

Describes a tract of 18,000 acres near Bremerton, Wash., half of which is devoted to the production of Christmas trees on a (coppice and seedling) naturally regenerated, sustained-yield basis, the details of which are given. Main demand is for 6- to 8-ft. trees; the smaller ones are supplied from thinnings, the larger from trees retained for cover. The cutting cycle is 2 years.

282. Bark Crops

See Nos. 305, 424.

283. Fruit and Seed Crops etc.

See Nos. 120, 279.

284. Crops Tapped for Exudations

See also No. 809.

454. BUNUŠEVAC, T. Der japanische Spindelbaum (*Evonymus japonica* Thunb.). Möglichkeiten

seiner Erziehung in Jugoslavien zwecks der Erzeugung von Guttapercha. **[The possibility of growing *E. japonicus* in Jugoslavia for the production of gutta percha.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/22/22, 1956. pp. 7 + 1 plate. [G.]

Describes planting trials with this species (grown as an ornamental in most parts of the country) and gives data on its phenology and the morphology of its roots, the amount of root produced and its gutta percha content, which varied from 2·31 to 13% of dry bark weight. It is concluded that its cultivation, by vegetative propagation, on favourable sites in nutrient-deficient, sandy, neutral or slightly alkaline soils promises well even in parts of Jugoslavia having a continental climate.

286. Osier-Growing

455. FORSHAW, J. E. **Basket Willows in Somerset.** *Agriculture (J. Minist. Agric., Lond.)* 63 (5), 1956 (229–32 + 2 plates). O.R.E.

Discusses species and varieties, including Harrison's (*Salix viminalis* × *S. purpurea*), site requirements, propagation, tending and harvesting, pests and diseases, and prospects.

287. Bamboo and Cane Growing etc.

See No. 278.

288. Crops Grown for Animal Products

456. BHATIA, C. L. **Successful cultivation of lac in Banaras forest division, Uttar Pradesh.** *Indian For.* 82 (7), 1956 (365–70 + 4 photos). 4 refs.

An account of the organization of the industry, methods of cultivation, figures of expenditure and revenue etc.

289.4. Shade Trees for Crops

See also No. 153.

457. BENSTEAD, R. J. **[Timber trees suitable for Cacao shade.]** *Proceedings, West African International Cacao Research Conference, Tafo 1953* [1954?] (96–8).

Lists > 53 suitable and > 32 unsuitable shade trees. Among the former are *Canarium schweinfurthii, Terminalia superba, T. ivorensis, Entandrophragma, Khaya,* and *Guarea* spp., *Chlorophora excelsa, Morus mesozygia, Maesopsis eminii, Sarcocephalus diderrichii,* and *Triplochiton scleroxylon.*

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

See also No. 1162.

302. Man and Work (Physiology and Psychology)

458. ARDELEAN, I., GONŢEA, I., ŞUŢESCU, P., and VINTILĂ, P. Cercetări asupra intensităţii efortului şi asupra rolului scoarţei cerebrale în procesul de adaptare a organismului în munca forestieră. **[Studies on the intensity of effort, and the rôle of the cerebral cortex, in the process of adapting the organism to forest work.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956,* 1956. pp. 7. 5 refs. [Rum.russ.f.]

459. ČERMÁK, K. Körper- und Gesundheitszustand der Forstarbeiter. **[The physique and health of forest workers.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/108, 1956. pp. 9 + 4 gphs., 1 dgm. [G.]

Based on the examination of > 4000 men and women in Czechoslovakia.

460. LUNDGREN, N., and SUNDBERG, V. **A method of using physiological tests in efficiency studies.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/101, 1956. pp. 3 + 5 gphs. 3 refs.

The same work is studied by means of both short physiological tests and time studies over a longer period, using the results to relate output to both time and energy consumed. Examples are given.

461. GLÄSER, H. Die körperliche Beanspruchung der Holzhauer im Holzeinschlag bei ein- und zweimänniger Hand- und Motorsägenarbeit. **[The physiological demands on forest workers in logging with one- or two-man hand or power saws.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/7, 1956. pp. 11 + 2 dgms. 7 refs. [G.g.]

Detailed tests under various conditions confirm earlier findings that energy consumption tends to be at a fairly constant level of 320–350 Kcal./hour. In fixing times for tasks employing new methods, however, the fact that it takes time for the worker to find this level, has to be taken into consideration.

462. KAMINSKY, G. Die energetische Belastung bei der Arbeit mit Hand- und Motorsägen. **[Energy consumption with hand and power saws.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/5, 1956. pp. 9. [G.]

Results of tests, taking carrying time into consideration, show that energy consumption per man per minute is somewhat greater for a 1-man power saw than a 2-man hand saw, but that output is more than proportionately greater.

304. Hygiene. Safety. Accidents and their Prevention

463. FRANKLAND, E. P. **Dermatitis from handling conifers.** *Quart. J. For.* 50 (3), 1956 (244–5).

Records the occurrence of dermatitis in a worker in Sitka Spruce plantations.

464. PUHANE, K. Für bessere Arbeitsbedingungen im Walde. **[Better working conditions in the forest.]** *Holz-Kurier, Wien* 11 (23), 1956 (7–8). [G.]

Report of a meeting of the Society for Forest Work Science (Geffa) describing demonstrations of a number of easily erected or wheeled shelters, and protective clothing, and discussing desirable improvements in power saws, chiefly reductions in weight, noise and vibration.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

See also No. 385.

465. ECKERT, K.-H. Der Zusammenhang zwischen Leistungsgrad und gemessener reiner Arbeitszeit und der Anteil der Leistungsgradschwankungen an den Gesamtschwankungen der Arbeitszeitwerte als Ergebnis von Tagesstudien. (Ein Beitrag zur Frage des Leistungsgradschätzens). **[The relationship between performance and measured 'pure working time', and the proportion of total variations in working times attributable to varying degrees of performance, based on whole-day observations. A contribution to the problem of performance rating.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/32/107, 1956. pp. 6 + 6 gphs. [G.g.]

306. Conditions affecting Work (Climate, Site, Stand etc.)

See No. 385.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 341–2, 347, 365, 379, 386, 393, 558.

466. TURPIN, P. Outils et matériel pour les plantations et le reboisement. **[Tools and equipment for plantations and afforestation.]** *FAO Information Document, FAO, Rome* No. 3, 1956. pp. 37. 22 refs. [F.] Limited distribution.

Notes on machinery and tools for clearing and cultivating land, digging holes, planting etc., prepared for the use of FAO regional commissions.

467. GIBSON, V. G. **Demonstration of forest machinery at Hatfield Park.** *Quart. J. For.* 50 (3), 1956 (224–6).

The exhibition was of machinery for work other than logging and nursery work, and machines were exhibited at work in a war-time felled woodland that had not been replanted. It included cultivators, drain-diggers, planting machines, and winches.

468. GLÄSER, H. Schlepper und Gerät in der modernen Forstwirtschaft. **[Tractors and implements in modern forestry.]** Institut für Waldarbeit und Forstmaschinenkunde, Universität Göttingen. 1956. pp. 15. 1 ref. [G.]

Lists the special requirements of tractors for forestry work and includes photographs of the 42-h.p., 4-wheeled M.A.N. tractor with winch, the Hanomag K90 crawler tractor with winch and with the 'Stubbenknecht' deep plough, the Hanomag half-track tractor, and the Unimog tractor with a trailer and with a snow-plough attachment.

31. Logging and Transport: General

469. DECAMPS, A. C. **Second report to the Government of Ceylon on mechanical logging.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 513, 1956. pp. 34 + 2 maps, 12 photos.

A second visit to Ceylon leads the writer to re-emphasize the points made in his earlier (1952) report, particularly the need for Government action to train workers, acquire equipment, and demonstrate mechanical logging methods.

470. KOROLEFF, A. **Report to the Government of India on efficiency promotion and research in timber harvesting.** FAO, Rome. No. *FAO/ETAP*/490, 1956. pp. 37 + 15 photos, 1 dgm. 50 refs. Limited distribution.

Discusses in general terms the lines of investigation necessary to promote efficiency in logging, and makes some more particular recommendations for Indian conditions.

471. GLÄSER, H. Wald und Holz in U.S.A. **[Forests and timber in the U.S.A.]** Verlag Kommentator G.m.b.H., Frankfurt/Main. 1956. pp. 192. [G.]

A report on a study tour, covering logging, transport and utilization, and discussing working methods, equipment, economics and research, with recommendations for Germany, chiefly regarding logging equipment and sorting, taking into account the fundamentally different conditions of the two countries.

472. LATHAM, B. **Unique swamp logging operation.** *Timb. Tr. J.* Ann. spec. issue, 1956 (70–1).

Cypress [*Taxodium distichum*]/Tupelo[*Nyssa aquatica*] forest, formerly considered economically worked out, is being logged very cheaply by dividing it into 1500- to 2000-acre ponds bounded by 4-ft. dykes constructed by dragline. Into these ponds water is led or pumped to provide draught for power boats which pull out, along clear channels, 100 logs at a time. Felling and cross-cutting are done by men in waders. The logs are lifted by crane into neighbouring canals and taken by barge or raft to a bandmill. Experiments are in train for lifting out inaccessible logs by helicopter, but costs are as yet uneconomic.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

473. GLÄSER, H. Untersuchungen über die chemische Entrindung und ihre Anwendbarkeit in deutschen Wäldern. **[Investigations on chemical barking and its applicability in German forests.]** J. D. Sauerländer, Frankfurt-am-Main. 1955. pp. 87 + 10 photos. 124 refs. [G.] P.R.

A brief survey of experimental work and experience gained in chemical barking in countries outside Germany, is followed by a detailed description of the author's own tests in Germany over the period 1950–53 on 2132 stems of different species, d.b.h. classes, sites and regions. The ease of barking was determined in 1953 by means of the Wilcox tool

[see *F.A.* 16 No. 522]; in the preceding years it was estimated by inspection and graded in 5 classes. Good peelability after chemical treatment was found with the following species: *Picea abies, P. sitchensis, Pinus strobus, Quercus* spp., *Fagus sylvatica* and *Populus* sp. The poorest effect was found with *Pseudotsuga taxifolia* and *Pinus sylvestris.* A good effect is usually associated with strong growth. Best results were obtained with Na arsenite (recommended concentration 20%); none of the other 100 chemicals tested compared favourably with it, the nearest being $NaHF_2$, 20% solutions of which gave results slightly below those obtained with 10% Na arsenite (with Spruce and Oak). Whether in solution or paste form, however, $NaHF_2$ was not certain of effect, even with Spruce. More reliable and consistent results (for Spruce) were obtained later with a specially prepared paste which was applied to the roughened surface of the ringed stem area. Finally, Na sulphamate produced perceptible improvement in peelability only in solutions of 40–60%. Better results were obtained with all chemicals when they were applied early in the year (May–June) rather than in July and August. The time of day had no significant effect. Other observations and tests quoted in the book refer to: (1) distribution of the poison in the treated stem; (2) loss in weight through drying of the standing tree and (3) undesirable effects. A chapter is devoted to the economic aspects of chemical barking. Total barking costs are lowest when Na-arsenite solution is used; they are higher with $NaHF_2$ paste, and much higher for mechanical barking. Other factors to be considered are: loss of wood in mechanical barking, and cheaper transport because of the loss in weight of chemically treated trees. In the last chapter the author discusses the possibility of introducing chemical barking into German forestry.

474. **Prelogging operation [in British Columbia] plays important role.** *Timberman* 57 (11), 1956 (82 . . . 88).

Removal of poles and piling by contractors with D2 Caterpillars is followed by company working with D6's, air-tong shovels and some high-lead sets to remove the smaller trees. Main logging is then easier and faster on tracks already prepared and the higher production rate frequently offsets the prelogging cost. Fire control and protection is easier and there is no salvage or slash clean-up. If main logging is postponed there is virtually an increment thinning.

323. Felling and Subsequent Primary Conversion

See Nos. 477 *et seq.*

325. Sorting and Assortments of Wood in the Rough

See also No. 513.

475. ERTELD, W. Grundsätzliche Fragen der Holzausformung. **[Basic questions in primary conversion.]** *Arch. Forstw.* 4 (5/6), 1955 (407–13). [G.]

Sketches the development of log grading and sorting for public sale over the last century in Germany, quoting various state systems, and pleads for more exact measurement of round timber and for better knowledge in the forest on which to base the judgment of quality and final use.

326. Sequence of Operations (including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

See Nos. 477, 505–6.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See also Nos. 487–8.

476. Défrichement mécanique par 'logging' (Australie). **[Mechanized clearing of vegetation by 'logging' in Australia.]** *Bois For. Trop.* No. 48, 1956 (83). [F.]

Describes a method of clearing bush etc. by dragging a heavy tree trunk attached by chains to two crawler tractors. The methods of fastening etc. are illustrated in drawings.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

477. STEINLIN, H. J. Travail à un homme dans des futaies mélangées de hêtres, d'épicéas et de sapins. **[One-man work in mixed stands of Beech, Spruce, and Fir.]** [*Publ.*] *FAO/ECE Jt. Comm. For. Working Tech.* No. *FAO/EFC/LOG*/55, 1956. pp. 80 + 10 gphs. 21 refs. [F.f.] Also in *Mitt. schweiz. Anst. forstl. Versuchsw.* 32 (2), 1956. pp. 82. [G.f.it.e.]

Gives detailed results of studies of the comparative value of one-man and two-man work in the forest, carried out by the Federal Forest Research Station at Zurich as part of more extensive time studies. A discussion of the methods and limitations of time studies is included [cf. *F.A.* 17 No. 2857], and special emphasis is laid on the great variation in output between different workmen, and in the same workmen on different processes. The investigations demonstrated significant differences in number of man-hours expended by one-man and two-man work on several phases of logging work, the former being significantly more economical in 'walking time' (to and from work, between trees etc.), preparation, and primary conversion (topping, trimming, cross-cutting etc.). This advantage of one-man over two-man work depends more on the assortments produced than upon tree size. For conifers, within the diameter limits considered (d.b.h. 12–40 cm.) it was shown that felling output for one-man and two-man work was almost the same; one-man work is technically possible up to a d.b.h. of 35 cm. For the methods and stands studied, its advantage in the phases mentioned above was < 20%, falling to ca. 15% when the assortments produced included only a small quantity of cordwood.

478. GERRITSEN, A. G. **Timekeeping of felling, lopping and barking in forestry in the Netherlands.** [*Docum.*] *12th Congr. int. Union For. Res. Organ.*,

Oxford 1956 No. *IUFRO* 56/32/102, 1956. pp. 5 + 7 gphs.

Describes methods used and shows results in graphs.

479. HILF, H. H., ECKERT, K.-H., and STREHLKE, B. Internationaler Leistungsvergleich im Hauungsbetrieb. **[International comparison of performance in logging.]** *Forstarchiv* 25 (7), 1954 (153–60). 23 refs. [G.g.]

In this comparison, introduced by FAO in 1952, 8 European countries took part. Comparisons were made of tables of performance and time studies, and the results are tabulated. Although the same tendencies are seen in all countries, times vary greatly for individual parts of the work. This may be accounted for partly by the quality of the wood varying from country to country, and partly by superior logging techniques.

480. HEEK, J. H. A. VAN. Bosarbeid in de sneeuw. **[Forestry work in the snow.]** *Ned. Boschb.-Tijdschr.* 28 (4), 1956 (75–7). [Du.]

Discusses briefly experience of winter work at Ruurlo. Important factors are: special shoes and footwear, suitable tools, and the payment of higher piece rates to compensate for necessarily slower work.

481. STEINGASS, K.-P. Über Sonderzusätze für Windwurf- und Windbruchaufarbeitung. **[Special wage supplements for the logging of windthrown and windbroken timber.]** *Forstarchiv* 25 (8), 1954 (184–5). 3 refs. [G.]

The supplementary wage scale suggested by Platzer [see *F.A.* 15 No. 3628] is only practicable in the case of an exceptional disaster occurring in the summer, when the timber will quickly lose its value through sun and insect injury. For winter windthrow, where the damage is not excessive, wage increases must be more moderate. After a hurricane in the night of 15–16 Jan., a wage supplement of 25% was agreed on. The work performances and earnings are tabulated. Other observations made were that the logging of cordwood presented no great difficulties, and whereas less work can be done per hour with sawlogs, the hourly rate of earnings can be kept up by increasing piece rates.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 461–2, 464, 495, 558, 944.

482. **New 'Bezner' peeler.** *Timb. Tr. J.* 218 (4167), 1956 (96).

The new model of this barking machine has an automatic feed and cowling to carry off the chips. It will peel up to 1600 cu. ft. per day of props > 3 ft. long and 1·5–8 in. in diam. Powered by a 10-h.p. engine, it is adaptable for electric or belt drive to suit other power units. A model is supplied without wheels for working on a permanent base.

483. PLATZER, H. B., and SACKEL, W. Erfahrungen mit hochgespannten Ein- und Zweimannbügelsägen. **[Experiences with highly tensioned one- and two-man bow saws.]** *Forst- u. Holzw.* 11 (7), 1956 (135–9). 6 refs. [G.g.]

Discusses the special features of saws with bows of oval tubular steel (Swedish type), their thin, narrow blades, the prevailing tooth shapes, and the operation of one- and two-man models. The cheapness of the blades allows frequent replacement and saves maintenance time.

484. SUNDBERG, U. **The use of power saws in forest operations (2nd report).** [*Publ.*] *FAO/ECE Jt. Comm. For. Working Tech.* No. *FAO/EFC/LOG/45*, 1955. pp. 38 + 43 photos & dgms. 18 refs. Price 4*s.* 6*d.* ($0·60).

Brings up to date the information contained in the previous report [cf. *F.A.* 15 No. 3632] and adds 18 references to literature later than 1951.

485. WAGNER, J. **Saw-chain maintenance.** *Sth. Lumberm.* 192 (2405), 1956 (46 . . 54).

A general article on working with, maintaining, and repairing chainsaws, including notes on some special equipment.

486. L'emploi des scies électriques dans l'exploitation du bois de haute futaie, auquel on applique différents traitements. **[The use of electric saws for the exploitation of high forest under different silvicultural systems.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, 1956. pp. 3 + 2 tbls. [F.]

Experiments in Rumania have shown that electric saws can be advantageously substituted for motor power-saws provided that the terrain is not excessively rough, that slopes do not exceed 60%, and that there is not very dense advance reproduction. Some data on performance of the CNIIMÈ-K5 electric saw are given.

487. **Machine chips Eucalyptus.** *Lumberm.* 83 (9), 1956 (71).

The organization and the machines used by Fibreboard Products Inc. of San Francisco in the harvesting of scattered stands of Eucalypts hitherto not utilized in California are described. Logs > 12 in. in diam. are handled conventionally. A portable chipper deals with material 4–12 in. in diam., and smaller stuff is burned.

488. FENTON, R. H. **Production and use of wood chips from Virginia Pine thinnings.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 80, 1956. pp. 14.

In a trial in dense 17-year plots, suppressed and intermediate trees of 1–4 in. diam. were felled and on plot 1 were trimmed, topped, cut to 10- to 15-ft. lengths, carried by hand to the chipping sites, and piled. This took 53 man-hours/acre compared with 12 man-hours on plot 2 where trees were felled or girdled but no material was removed. The yield of green chips was 1660 cu. ft./acre, representing a thinning of ca. 6·9 standard cu. ft./acre. Chip production, using a mobile chipper, a 2-man crew to feed it and a lorry, was 2·32 tons green weight or 1·18 tons air-dry weight/hour. Chipping costs were $3·37/hour and total costs from stump to lorry $4·55/green ton or $8·94/air-dry ton of chips. The chips proved satisfactory for cattle bedding and poultry litter.

489. SCHLÜTER. Eine Hochdruck-Rückenspritze als forstliches Signiergerät. [**A portable high-pressure pump as a marking tool for forestry.**] *Forst- u. Holzw.* 11 (15), 1956 (326–30). [G.]

The pump, an adaptation of a knapsack sprayer, weighs ca. 8 kg. when full. It holds 4 litres of paint, of which two types of varying durability and cost are supplied, both on a synthetic resin basis, for dilution with water, non-toxic, quick drying and odourless. A 1-mm. jet from a nozzle is deflected and directed by a projecting metal plate, thus avoiding splash-back and facilitating the drawing of lines.

490. **Woods and sawmilling equipment.** *Timber of Canada* 17 (7), 1956 (55 . . .63).

Contains short descriptions of new or improved models of heavy cranes, truck cranes or fork lift trucks, chain saws, bulldozers, a power hoist, a logging arch, and the Nel-spot Paint Hammer which, compared with the brush method, is said to mark 4 times as many logs/hour and save 75% paint.

491. ANDERSON, L. F. **One-man stump remover perfected.** *Trees Mag., Ohio* 16 (5), 1956 (16, 25).

Describes the 'Stump Beaver', an electrically operated machine, mounted on a 2-wheeled semi-trailer, which destroys stumps to well below ground level by reducing them to chips *in situ*. Cutting is done in horizontal layers by a rotary cutting-head, and chips fly only at a low level. Total weight is ca. 400 lb. The machine was invented and is manufactured by the author (Verona, Mass.).

492. FORBES, R. H. **Stump drilling speeds right of-way-clearance.** *B.C. Lumberm.* 40 (6), 1956 (38–9).

Describes an improved auger operated by a chain-saw engine and having detachable, easily sharpened, auger tips, which is manufactured by McCulloch of Canada. It is claimed by one sawmilling firm that this machine cuts the cost of blasting large stumps by one-third, with savings in both powder and time.

493. GUGLHÖR, M. Zu: Über das Ästen von Überhältern. [**On 'The preparation of standards for felling'.**] *Forstarchiv* 25 (3), 1954 (58–9). [G.]

Instead of the metal ladder described by Platzer [see *F.A.* 15 No. 3612], the author recommends a rope ladder 16 m. long and weighing 16 kg., with wooden rungs, the rope of the sides being formed of three 8-mm. woven hemp strands. For hoisting and tautening the ladder, there is an iron ring at the top, to which a rope 20 m. long and 12 mm. thick can be attached. This can be lengthened if necessary by a 30-m. cord. A bamboo pole with a special attachment is used to pass the first rope over the lowest branch.

37. Transport

371. Loading and Unloading

See also Nos. 495, 503.

494. STANISLAV, V., and BENČ, J. Portálový kábelový žeriav prútovej konštrukcie na expedičné sklady. [**Gantry crane with cableway carriage for forest depots.**] *Les, Bratislava* 2 (10), 1955 (437–40). [Slovak.]

The prototype (illustrated) was completed late in 1954 (length of gantry, 51 m.; carrying power of crane, 5 metric tons; of cable, 112 tons; lift 6·5 m.; maximum pressure on railway track 6750 kg.). It will be used for loading and unloading roundwood and pulpwood at standard-gauge sidings. A detailed description of its operation will be published later.

372/377. Land Transport

See also Nos. 468–71, 490, 820–2.

495. MCGRATH, K. P. **Modern developments in logging engineering.** *Aust. Timb. J.* 22 (6), 1956 (600 . . . 628).

The script of a lecture to the Institution of Engineers, Australia, discussing in detail recent developments in felling, skidding, loading and haulage, the world over, with particular reference to Australia, where the annual transport of 20 million tons of wood from the forest now requires local research.

496. LAMP, I. Leistungstafeln für die 'Lieferung' und Lagerung des Holzes im Gebirge. [**Performance tables for extraction and storage of wood in mountainous country.**] *Allg. Forstztg.* 65 (15/16), 1954 (192–3). [G.]

Describes the official Bavarian tables and, because of their simplicity, urges their adoption for Styria. Examples are given of the points system for difficulties and of times allowed by distances and difficulty classes, including times for the building of chutes etc.

497. LÜNZMANN, K. Physikalische Grundlagen des Holzrückens. [**Physical bases of skidding.**] *Forstarchiv* 25 (7), 1954 (167–8). [G.]

The various factors involved are analysed and discussed. The coefficient of friction (μ) can be increased 13–20% by wrapping chains round the log, and decreased 40–45% by the use of logging arches [cf. *F.A.* 15 No. 2574]. Tables compiled from the literature show μ for logs of various species on different surfaces.

498. GÜLTLINGEN, VON. Windenbedienung durch Ultraschall. [**Ultrasonic control of a winch.**] *Holz-Kurier, Wien* 11 (32/33), 1956 (5–7). [G.]

A description in general terms of the use of an ultrasonic whistle, receiver, and switch for the remote control (up to 80 m.) of a logging winch. [See *F.A.* 17 p. 613.]

499. MEYR, R. [Editor]. Seilbahnbau in der Schweiz und in Frankreich. Berichte und Ergebnisse zweier Studienreisen. [**The construction of cableways in Switzerland and France. Report on and conclusions of two study tours.**] Österreichisches Produktivitäts-Zentrum, Vienna. 1954. pp. 107. 3 refs. [G.]

The 7 participants describe cableways and winches of many types, for short and long distances, including the Valtellina Cableway, an ingenious but simple type used by Italian migratory workers in the Ticino and French Alps, and discuss their applicability under Austrian conditions.

500. SEIDL, S. Erfahrungsbericht über einen neuen Seilkran. **[Report on a new skyline crane.]** *Allg. Forstztg.* 65 (5/6), 1954 (66–7). [G.]

A description by the inventor of its construction and operation. Features include the use of an endless operating cable, installation of the winches at the lower end, a separate lifting cable for which the carriage is fitted with a special drum and a mechanism whereby this cable can be operated from the main winch, and a small 'trailer' behind the carriage proper, which makes it possible to transport logs horizontally.

501. L'amélioration du funiculaire type Wissen et son adaptation aux conditions du terrain en Roumanie. **[The improvement of the Wyssen-type cableway and its adaptation to topographic conditions in Rumania.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956*, 1956. pp. 2. [F.]

Briefly describes the use (in Rumania) of two Wyssen cableways, coupled together by a system of gears, so that when a full carrier is descending, an empty one is automatically returned to the starting point, only one motor being used. When necessary, e.g. for loading or for transporting loads uphill, both motors can be used. The use of such an installation reduces consumption of fuel and lubricants by 80%, and raises production by 60–80%, a double cableway handling 10–15 cu.m. compared with 5–7·5 cu.m. on a single one. Labour requirements are reduced by 40%. Installations of this kind are in use by two Rumanian forest enterprises.

502. G., K. Kleinseilgeräte—Helfer im Gebirgswald. **[Small cable equipment—aids in mountain forests.]** *Holz-Kurier, Wien* 11 (14), 1956 (5–6). [G.g.]

Describes two cable winches of Austrian construction, of which the larger, the 'Bergkuli', is powered with a 12–14 h.p. Diesel motor with tractive power of 3500 kg., is mounted on wheels, and can negotiate gradients up to 40%, while the smaller, lighter one, the 'Zwergkuli' is mounted on runners and when dismantled forms 3–4 carrying loads. Both can be used for ground skidding (200 m. downhill, 250 m. up) of loads up to 2·5 cu.m. and 1 cu.m. respectively, or with a skyline (400 m. up, 600 m. down), load 1500 kg. Operation is stated to be simple, no special cable crews being required.

503. MÉGILLE, X. B. DE. **The bundling of small-sized timber.** [*Publ.*] *FAO/ECE Jt. Comm. For. Working Tech.* No. *FAO/EFC/LOG*/52, 1955. pp. 17 + 6 dgms.

Reports on two preliminary studies: (1) of different methods of bundling cordwood (metal-strip, two wires, one wire, wire slings), (2) of comparative costs for loading, unloading, and transport of bundled and unbundled cordwood from felling site to timber yard, including several transhipments. Results are tentative and the need for further study is stressed.

504. PERFILOV, M. A., ŠOŠIN, N. A., and LAZAREV, M. F. Traktornaja trelevka s predvaritel'nym formirovaniem vozov. **[Bunching logs in advance for tractor skidding.]** *Lesn. Prom.* 15 (7), 1955 (10–2). [Russ.]

Describes a new method of work organization which reduces the time required for bunching from 25 to 14 min. by treating it as a separate job to be done in advance by another tractor and crew.

505. JINDRA, J. Výroba surových kmenů. **[Tree-length logging.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (5), 1955 (709–36). 8 refs. [Cz.cz.russ.g.]

A comparison of conventional logging methods for Spruce and Pine with tree-length logging to main or railway depot, showed that, for tree-length logs of 0·10–1·3 cu.m., the latter method raised over-all productivity by 5–11%, reduced the number of single operations, reduced the total logging work in the forest by 6–18%, and improved the quality of production without increasing the production costs.

506. MACKEY, J. R. **Wheeled-tractor skidding of tree lengths.** *Pulp Paper Mag. Can.* 57 (9), 1956 (140 . . 148).

Describes an 8000-cord operation recommended for more general adoption, in which trees are felled, trimmed and topped at stump, skidded by wheeled tractors to central slashers, which cross-cut them to bolt and log lengths and load them by conveyor on to lorries. Preparation of the ground, equipment, crews, roads, operation, production and costs and further recommendations are covered.

507. LOYCKE, H. J. Bringung von Stammholz mit neuen Rückewagen. **[Extraction of stemwood with modern sulkies and logging arches.]** *Forstarchiv* 25 (7), 1954 (161–6). [G.g.]

The efficiency of skidding along the ground, skidding with logging arches, and hauling with coupled logging arches was tested at Bodenwöhr, Bavaria, and Rhoden, Hesse, and the results are tabulated. Horse traction with a chain or cable gave the best results over short distances, as motor-driven vehicles took longer to load and unload and are only practical for hauls > 200 m. Among modern equipment discussed (with photographs) are sulkies (the Swiss Rückrolli and the Württemberg Widder) and the following logging arches: 'Vomo' Wachläufer Type II taking 3·5 metric tons, the Salmünsterer (3 tons), the Heuell-Bauer G III (3·5 tons, the Brunnmüller DP836 146 (tractive power ca. 450 kg.), and the Schwarzwälder, taking 8 tons.

508. KARJAKIN, K. Trelevka lesa traktorami S-80 na predprijatijah Urala. **[Skidding with S-80 tractors in the Ural forest undertakings.]** *Lesn. Prom.* 15 (7), 1955 (4–7). [Russ.]

Comparative skidding of tree-length logs (skidding distance 200 m., in Spruce/Silver Fir with some Birch and Aspen, stocking 180 cu.m./ha., mean stem volume 0·26 cu.m.) has shown that the output of one S-80 tractor (3 operators) is greater than that of two KT-12 tractors (4 operators). Since the load drawn by the S-80 tractor consists of 30–40 small stems, suitable trailing equipment is of importance. New equipment of this kind is illustrated and described. It consists of two collecting cables 15–18 m. long and 18 mm. thick, and a number of

chokers 2·5–3 m. long and 12–14 mm. thick. Each collecting cable has at one end a ring which is put on one of twin hooks at the rear of the tractor, and at the other end a loop for the insertion of an open holding ring. The chokers are fixed to the individual logs, their rings are threaded on one or other of the collecting cables and the holding ring then inserted. When the tractor arrives at the collecting point the two cables with their loads are trailed individually to it, the collecting cables are then removed and taken back to the felling area, the chokers are attached to the twin hooks and the tractor hauls the load to the forest dump. It was found that, to increase tractor output, the main skidding roads should be 8 m. wide in summer and 10 m. in winter. Logging in strips only 8–10 m. wide is recommended, five of such strips forming one felling site. The felling starts in the middle strip, which later becomes the trail. Trees in the next adjacent strips are felled so as to form an angle of 15–20° with the trail, while those in the outermost strip form an angle of up to 40–45°. Collecting cables are used only for skidding trees felled in the middle strip; other felled stems are skidded with chokers only.

509. **Provisional protocol for the testing of forest tractors.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/EFC/LOG*/64, 1956. pp. 48 + 3 dgms. Obtainable from the Sales Section, European Office of the United Nations, Geneva. Price 2*s.*

510. **Specification of crawler tractors in the 32 to 400 drawbar horsepower range.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1583 (*B*–8–*f*), 1956. pp. 15.

Covers the 31–240 drawbar h.p. range for Oliver, Vickers, International, Caterpillar, and Allis Chalmers, and for those makes equipped with torque converters (recommended for woods operations), the last 3 above, plus Terratrac and Eimco in the h.p.-at-flywheel range of 31–400. Smaller tractors (19–31 h.p.) were covered in No. 1479 of this series. [Cf. *F.A.* 17 No. 4033.]

511. GENGE, G. A., *et al.* **Mark IV logger performance trials on regular woods operations.** *Pulp Paper Mag. Can.* 57 (7), 1956 (162 . . . 177).

A critical appraisal of performance and costs with suggestions for improvements made in three pulpwood extraction areas.

512. **Machinery at the Royal Show.** [**Forestry section.**] *Timb. Tr. J.* 218 (4165), 1956 (97).

Lists and describes briefly machinery shown, including the 'Weasel', marketed by Thomas Niven, Carlisle, a 9–10 h.p. water-cooled diesel caterpillar tractor with power take-off. It is 78 in. long and 30 in. wide over tracks, with a ground clearance of 10 in. and a turning circle of 78 in. [diameter].

378. Water Transport

See also No. 472.

513. STURMAN, A. **Electronic sorting.** *N.Z. Timb. J.* 2 (12), 1956 (33–4).

Describes the dry-land sorting of barked logs on a 165-yard longitudinal conveyor into 17 diameter classes, adopted by Igelsta Trävaru AB at Östertälje, Sweden. Water sorting involved a loss by sinking of 20% before rafting and 6 men instead of the one man now employed. The equipment was designed and made by Philips Electrical Industries, Holland.

514. KUŽMA, A. P. Kater s vodometnym dvižitelem. [**Rivercraft with water-jet propulsion.**] *Lesn. Prom.* 15 (7), 1955 (23–4). [Russ.]

Illustrated description of a small river craft designed in 1953 and used in several regions of the Eniseĭskles forests for water transport and floating work.

515. **New 'Staffa' barge crane, a lightweight unit for low mounting.** *Timb. Tr. J.* 218 (4173), 1956 (90).

The crane, manufactured by Chamberlain Industries Ltd., London, E.10, is hydraulically operated, having a 30-ft. boom, capable of unloading the whole length of a barge and equally suitable for mounting on a wharf or lorry. Capacity is 10 cwt. at 30-ft. radius, with lifting, derricking, and swinging speeds of 150 ft./min., 30 to 12 ft. radius in 17 sec., and 4 r.p.m. respectively. Power is from a 4-cylinder Ford diesel.

38. Forest Engineering

382. Buildings (Logging Camps etc.)

See also No. 464.

516. KI., and OT. Waldhütten. [**Forest shelters.**] *Wald u. Holz.* 37 (10), 1956 (234–8). [G.]

Gives specifications for a portable hut of Swiss make and for the German-made caravan-type 'Itzelberg' trailer.

517. **Wheels: key to fast moves in MacGregor Triangle operation.** *Timberman* 57 (11), 1956 (98, 100).

Describes a mobile logging camp in Idaho for 30 men and 9 families with cook- and shower- houses and repair shop, lighting and heating by butane gas, and gravity water supply where feasible.

383. Roads and Bridges

See also No. 468.

518. FORBES, R. H. **High standard logging roads to beat the bugs.** *B.C. Lumberm.* 40 (8), 1956 (64, 66).

Covers equipment, methods and specifications used in the construction of main and secondary roads made by the Potlatch Forests Inc. for the salvage of timber attacked by the Engelmann Spruce bark beetle. In the Pacific Northwest some hundreds of miles of such roads have been constructed.

519. Waldwegebau. [**The construction of forest roads.**] *Forst- u. Holzw.* 11 (14), 1956 (287–96). [G.]

A special number, including experiences and results of 3 years' forest road construction in the Harz mountains (*Kiesekamp*) and a report on the FMA/Pokorny Compressor DV20 for quarrying road metal and gravel (*W. Schüssler*).

520. HAFNER, F. Erfahrung bei Planung und Bau von Forstwegen mit mechanisierten Mitteln. [**Experiences in the planning and construction of forest**

roads with mechanical equipment.] *Repr.* from *Der praktische Forstwirt für die Schweiz, Aarau* No. 1, 1955 (5–15). [G.]

Deals chiefly with the changes in road location made necessary or possible through the use of bulldozers or angledozers, motor graders etc.

521. AGER, B. H. Snöpackade vägar för virkestransport. [**Snow-packed roads for timber transport.**] *Skogsägaren* 32 (7), 1956 (210–3). [Sw.]

Describes briefly, with some illustrations, equipment used to mix the older coarse snow with the fresher, finer snow, to compact and to smooth the surface, and to maintain the roads during the winter.

522. BAGDASARJANZ, B. Zur Frage des Oberbaues von Waldstrassen. [**Forest road construction and surfacing.**] *Wald u. Holz* 37 (10), 1956 (226–34). [G.]

Compares the cost of various methods of road construction, and concludes that under the conditions of the Zurich instructional forest, and wherever excessive speeds can be avoided, current costs (interest on capital plus maintenance) of the older types of metalled roads compare favourably with modern construction methods, e.g. concrete.

523. DUHM, J. Frostschäden an Strassen und Wegen, ihre Ursachen und Massnahmen zu ihrer Behebung. [**Frost damage to roads and tracks, its causes and remedies.**] *Allg. Forstztg.* 65 (13/14), 1954 (171–3). 1 ref. [G.]

Discusses causes of subsidence, heaving etc., on roads of varying construction and over different soils, and the building of frost-protection layers below the main body of road-metal. The dangers are aggravated not only by the present-day heavy loads but by the habit of clearing away the snow, which causes deep freezing. Restriction of heavy traffic during periods of thaw is advocated, for which frost indicators (instruments measuring the state of frost and thaw at varying depths) should be of help.

384. Protective Works, including Torrent Training

See also No. 1162.

524. Wildbach- und Lawinenverbauung in Österreich. [**Torrent training and avalanche control in Austria.**] *Allg. Forstztg.* 65 (23/24), 1954 (281–324). 22 refs. [G.]

A special number containing historical articles, such as: The afforestation of the Schmittenbach watershed near Zell-am-See, its history and effect on streamflow (*H. Hartwagner*) (an account of works dating back to the 1880's, which have stood the test of the 1954 flood year); Torrent control in the 'Bucklige Welt' (*J. Schrems*), an account of early successful work at altitudes below 1000 m. in Lower Austria; and articles on general subjects, including: Research and experiments [in Austria] in the field of torrent training and avalanche control (*R. Hampel*) (with a bibliography); Torrent training and management (*V. Praxl*) (stressing the need for maintenance by forest owners); Torrent training and the opening up of forests (*J. Jaksche*) (dealing with roadbuilding to serve both interests, and training systems compatible with river driving); and The effect of general land-use measures in torrent watersheds on streamflow and detritus (*H. Stanek*).

525. WEBER, A. **Static considerations on dam-building in Austria.** [*Docum.*] *3rd Sess. FAO European For. Comm. Wkg. Party on Torrent Control, 1956* No. *FAO/EFC/TORR/7*, 1956. pp. 11. Limited distribution.

385. Drainage, Irrigation, Sedimentation. Water Supply

See also No. 467.

526. HÄMÄLÄINEN, M. S. Ny finsk dikningsplog av god typ. [**A new, well designed Finnish plough for constructing drainage ditches.**] *Skogen* 43 (13), 1956 (396–7). [Sw.]

The plough (illustrated) was developed through co-operation between forestry and research organizations and the Lokomo machine company. It has two symmetrical mouldboards and a rotating blade, placed between the side wheels, that cuts to a depth of 40 cm. It is drawn by a 10- to 14-ton tractor. Ditches are cut at a rate of 200–600 m./hour and costs are 25–35% of those for ditch digging by hand or using explosives. The Forestry Board, using 12 plough-and-tractor units, cut 2430 km. of new ditches in July–Dec. 1955. A snow cover 50–60 cm. deep does not hinder the work as long as the ground is not frozen.

527. **'Landrainer' ditcher.** *Timb. Tr. J.* 218 (4165), 1956 (98).

The 'Landrainer' (illustrated), designed for towing behind a tractor, is hydraulically operated. A telescopic boom, on which the bucket is mounted, is controlled by a push-pull ram which enables 5-ft. stretches to be dug with the tractor stationary. Ditches can be dug to a depth of 6–8 ft., with sloping sides and a width of 2–6 ft. at the top. Average rate is 2–3 chains/hour. Manufacturers are W. and G. (Challow) Ltd., Challow, Wantage, Berks.

4. FOREST INJURIES AND PROTECTION

See also No. 772.

528. SPAIĆ, I. Problematika zaštite šuma u NR Hrvatskoj. **[Problems of forest protection in Croatia.]** *Šum. List* 79 (11/12), 1955 (440–68). [Croat.g.]

Deals with the health of the following important forest species in Croatia: Oak, Elm, Ash, Beech, Chestnut, Poplars, Silver Fir, Spruce, Scots Pine and Austrian Pine. During the first post-war decade the main achievements in forest protection have been: (1) the passing of the forest protection law; (2) publication of the necessary basic literature; and (3) control of pests by aerosols from aircraft.

529. VAJDA, Z. Stanje bukovih sastojina na Učki. **[Condition of Beech stands on Mt. Učka.]** *Šum. List* 79 (11/12), 1955 (579–87). 9 refs. [Croat.g.]

Discusses the causes of the dying of many Beech trees and stands in this area during the last decade: climatic (drought, soil erosion), economic (excessive fellings during the last 30 years), and biotic (white rot, attack by *Agrilus viridis*).

530. STEFANOW, D. Zustand und Aufgaben des Forstschutzes in der VR Bulgarien. **[The present position and tasks of forest protection in Bulgaria.]** *Arch. Forstw.* 4 (5/6), 1955 (588–91). [G.]

Gives the area deforested up to 1944 as > 1 million ha. The greater part of the broadleaved forest had been reduced to coppice, with a diminution of stocking in the rest. The 1953–57 plan includes replanting at least 225,000 ha. and vigorous measures against insect pests. The organization of protection and future tasks in research are discussed. The areas dusted from the air, mainly against 5 lepidopterous pests, are detailed with costs.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

See also Nos. 285, 391, 481, 671.

531. JUNGHANS, W. Praktisches Beispiel einer Windschutzanlage. **[Practical example of a protection installation against wind.]** *Holz-Zbl.* 82 (110), 1956 (1337). 1 ref. [G.]

The author describes the planning and setting up of his apparatus [see *F.A.* 15 No. 1458] in a mixed conifer stand (chiefly Spruce). Materials needed and labour costs slightly exceeded the original estimate.

532. MISHIMA, T., TANIGUCHI, S., and TANIGUCHI, M. **[The actual states of wind damage in the Tomakomai experiment forest of Hokkaido University. (1) On the plantation of strange land [exotic] species.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (715–48 + 26 photos). [Jap.jap.e.*e.*]

One table summarizes the effects of 'Typhoon 15' showing the data in stems/ha. and % of uprooted and broken stems, leaning stems, and broken tops, the respective means of which were 14·5, 1·6, 17·3 and 0·2%. The greater the diameter, the greater the wind damage. Broadleaved windbreaks gave very effective protection to plantations of exotic Larch, Spruce and Pine.

533. LE ROUX, H. H. **Wind damage to *Pinus patula*.** *J. S. Afr. For. Ass.* No. 26, 1955 (62–6). 1 ref.

In stands in the Sabie district, consisting of ca. 50% *Pinus caribaea* and *P. taeda*, 90% of wind damage occurs in *P. patula*. These losses, predominantly broken stems, have occurred only in the oldest stands (20–25 years). The densities (130–200/acre) are normal. The author advises frequent thinnings after 12–16 years, to reduce the density gradually, continuing these to a later age than at present, so as to keep the canopy even and unbroken from 18 years on.

534. CLARKE, R. W. **Wind damage in planted stock and natural regeneration of *Pinus radiata* at Mount Stromlo, A. C. T.** *Aust. For.* 20 (1), 1956 (37–9).

In a study made after severe gales and rain, it was found that the stability of notch-planted *P. radiata*, ⩽ 5 years old, against wind pressure depended largely on the nature and extent of its root system. Planted Pines were generally found to have a shallow, poorly developed root system compared with natural regeneration, and were less wind-firm. Other factors were soil conditions and the position of the plant in relation to site and aspect. *From author's summary.*

535. SPURR, S. H. **Natural restocking of forests following the 1938 hurricane in central New England.** *Ecology* 37 (3), 1956 (442–51). 16 refs.

Studies of natural restocking in and around Harvard Forest, Mass., during the decade following the hurricane of Sept. 1938 have yielded information on successional trends in hurricane blowdown areas. The more important factors affecting the composition of the new stand are: soil type, composition of the former stand, advance growth present at the time of the catastrophe, and whether or not the affected area was subsequently logged. Where ample advance growth was present and no logging was carried out, the new stand is essentially a late-successional association composed of the released understorey trees. Where advance growth was present and logging was done, the released understorey trees are mixed with pioneer species that have seeded in on the disturbed areas. Where little or no advance growth was present, pioneer associations exist. In almost all cases, the character of the new stand was apparent within two growing seasons of the hurricane. *From author's summary.*

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 82, 120, 163, 285, 323, 328, 529, 703.

536. **[Damage by frost.]** *Rep. For. Dep. Nyasald. 1955*, 1956 (14–5).

On the Nyika, where 17° F. was recorded, Pine nurseries suffered. In the Misuku Hills foliage scorch of *Parinari excelsa* lasted till December. In the Lelongwe Basin (26° F. recorded) *Brachystegia* and *Uapaca* spp. were scorched over many square miles, and on the Zomba Plateau, Mlanje Cedar and *Podocarpus milanjianus* were affected.

537. ISHIDA, S. **[Morphological study on frost crack of Todo Fir [*Abies mayriana* and *A. sachalinensis*].]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (473–512 + 53 photos). 9 refs. [Jap.jap.e.*e.*]

Contains comprehensive tables and 53 clear photographs illustrating the external marks, the distribution of moisture (m.c.), internal cracks (along rays and rings) packed with ice in winter, callus and frost rib, and similar defects unconnected with frost. Frost cracks often occur near limbs or lesions, where wood is exposed and wetwood (80–100% m.c.) develops. If disks are frozen this wood becomes visible to the naked eye and appears darker on photographs. [Cf. *F.A.* 14 Nos. 1282–3.]

538. DUFFIELD, J. W. **Damage to western Washington forests from November 1955 cold wave.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 129, 1956. pp. 5 + 3 maps.

A survey of the damage, with maps showing location and relative severity of damage to Douglas Fir, Western Hemlock and Western Red Cedar.

539. JAEGER, E. Eigenartige Frostschäden an der jap. Lärche im Winter 1955/56. **[Peculiar frost injuries to Japanese Larch in the winter 1955/56.]** *Forst- u. Holzw.* 11 (16), 1956 (350–1). [G.]

Japanese Larch in nurseries all over Germany showed a discoloration of the cambium above the root collar. Though they produced shoots, most of them slowly died. The cause may be the sudden sharp frost after warm weather in October or the very sharp frost in February, which followed a mild January.

540. JACOBSEN. Spätfrostbekämpfung. **[Protection against late frost.]** *Forst- u. Holzw.* 11 (14), 1956 (297). [G.]

Describes the construction of simple peat mounds, covered by grass sods to prevent the fire spreading, and ignited by a turf soaked in diesel oil, as a cheap, safe, and efficient source of smoke for frost protection in nurseries etc.

541. KRAHL-URBAN, [J.] Spätfrostbekämpfung. **[Protection against late frost.]** *Forst- u. Holzw.* 11 (8), 1956 (155–7). [G.g.]

Fires of Spruce branches protected 1- to 7-year-old Oak and Beech plantations if temperatures did not fall below — 2° C. and there was not much wind. 'Swingfog' portable fog generators, using Anorgana A100 fog preparation combined with 'Fumex' frost-protection cartridges, were effective down to — 3° C. They had no phytotoxic effects.

542. TRUE, R. P., and TRYON, E. H. **Stem cankers on Oak associated with drought.** *Abstr.* in *Phytopathology* 46 (8), 1956 (470).

Examination in 1955 of cankers associated with the 1953 drought showed that of the species affected in West Virginia the Red Oak group was chief. Suppressed trees were rather more severely affected. Cankers were most abundant on Red and Black Oaks near ridges, there being none on adjacent alluvium. The south side of single and the in-facing sides of twin stems were the most frequent positions, and twin stems were more severely affected than single. No pathogens were isolated from canker sapwood. The lesions were associated with acute water shortage.

423. Precipitations

543. ROBERTS, E. G., and CLAPP, R. T. **Effect of pruning on the recovery of ice-bent Slash Pines.** *J. For.* 54 (9), 1956 (596–7). 1 ref.

Near State College, Mississippi, after a severe ice storm in 1948, 15 Slash Pine saplings bent horizontal and 9 bent 30–50° were pruned to the leader. For each a near-by tree of similar diameter and lean was left unpruned. After a year all the pruned trees had grown straight; of the unpruned, only those with 30–60° lean had grown straight. Diameter growth was slowed up at first by pruning, but after 7 years it differed between pruned and unpruned trees by only 1·1%.

544. THOMAS, J. B. **Hail damage in Lake Nipigon area.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (2).

Examination in spring 1955 of an area of forest affected by a severe hail storm in July 1954 showed that all species of trees and shrubs were affected. Scarring of the bark occurred only on the W. side of trees and was greatest in the upper parts. Some small Aspen and Mountain Ash [*Sorbus* sp.] had died. White and Black Spruce and Jack Pine reproduction showed many scars but had recovered; Balsam Fir reproduction was more severely affected, and though stocking may not be much reduced, individual trees may have lost several years' height growth owing to killing of tops.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 357, 411, 702.

545. TAKATOI, I., KURAMOTO, M., and TOYOOKA, H. **[The poor growth of the Larch plantations on peaty soils.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (18–30). 7 refs. [Jap.jap.e.]

An examination of the growth of a 16-year Larch plantation and its soil, where deaths were occurring at 10 years, showed that the oxidation-reduction potential was higher in the area of better growth. Profiles were similar and no fungal pathogen was observed.

546. WALKER, L. C. **Foliage symptoms as indicators of potassium-deficient soils.** *For. Sci.* 2 (2), 1956 (113–20). 25 refs.

This exploratory study, of practical application for planting abandoned farmlands in the Adirondacks, covers these symptoms in the leaves of *Prunus serotina*, *Betula populifolia*, *Acer rubrum*, *Pinus strobus*, and *Rubus* spp. Critical values for

K concentration, below which leaf tissue collected in mid-August may be expected to show these symptoms in the Birch, Maple and Pine are 1·0, 0·6 and 0·4% respectively. Application of 200 lb./acre of 60% KCl removed them.

547. **[Effect of chemicals in reducing chlorosis.]** *Rep. Sth. For. Exp. Sta. 1954* [1955] (14).

Preliminary tests at the Crossett experimental nursery in S. Arkansas indicated that a new chelate—Chel 330 FE—was less toxic than Sequestrene NaFe. The latter damaged some minor Southern Pines and some exotics. Neither compound harmed Loblolly and Shortleaf, and both aided recovery from chlorosis. [Cf. *F.A.* 15 No. 361.]

548. CALTON, W. E., and VAIL, J. W. **Micronutrient problems in Tanganyika.** *Trans. 6th int. Congr. Soil Sci., Paris 1956* Vol. *D*, 1956 (31–5). 2 refs. [E.g.f.]

Acacia decurrens var. *mollissima* at Njombe suffering from dieback responded favourably to sprays containing B superimposed on N, P and NP soil treatments; $(NH_4)_2SO_4$ appeared to increase the incidence of dieback. In 4 months, there was a marked improvement in growth of unthrifty young Pines in the Mbeya district treated with B + Zn spray superimposed on various combinations of NPK; certain fertilizer mixtures appear to reduce the response.

549. BEAUCORPS, G. DE. Observations relatives à l'article de R. Karschon 'La croissance d'*Eucalyptus*] *camaldulensis* Dehn sur sols calcaires salins'. **[Observations relative to R. Karschon's article 'The growth of *E. rostrata* on calcareous saline soils'.]** [*Docum.*] *2nd Sess. Working Party on Eucalypts, FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/EU/7-D*, 1956. pp. 3. [F.]

Analysis of a case of chlorosis in an *E. rostrata* nursery in Morocco leads to the conclusion that this condition can occur in nursery stock growing in pots with a humous soil, when watered with water containing a high content of CO_3 and low Ca/Na ratio. [Cf. *F.A.* 17 No. 3706.]

425. Chemical Influences (Atmospheric)

550. GRAYSON, A. J. **Effects of atmospheric pollution in forestry.** *Nature, Lond.* 178 (4536), 1956 (719–21).

Summarizes 4 papers read at a session of Section K* of the British Association at Sheffield (Sept. 1956): Some problems of private forestry in the industrial areas (*E. M. Conder*); Atmospheric pollution effects in Yorkshire (*A. J. Grayson*); general discussions of the subject (*G. Scurfield*) and (*P. F. Wareing*).

43. Forest Fires

551. **Modern forest fire management in the South: Proceedings of the 4th annual forestry symposium, Louisiana State University, Baton Rouge, Louisiana, 6–7 April 1955.** School of Forestry, Louisiana State University, Baton Rouge, La. 1955. pp. 113.

Includes the following papers among others: Forest fire prevention by a State forestry agency (*A. D. Folweiler*); Wildfire today in Southern forests (*A. W. Hartmann*). Possible causes of blow-up fires (*G. M. Byram*) [cf. *F.A.* 16 No. 604]; The principles and uses of fire danger measurement (*R. M. Nelson*); The economic combination of towers and air patrol in fire detection (*A. C. Worrell*); The use of fire in the management of Shortleaf/Loblolly/hardwood type on the Texas National Forests (*P. Y. Vincent*); Prescribed burning in Loblolly Pine management (*R. J. Riebold*); and Fire-scorched trees—will they live or die? (*E. R. Ferguson*). The last paper describes a study of Pines injured during prescribed burns, in order to determine the degree of injury that could not be survived. The following classes are most likely to die: (1) All foliage consumed; (2) complete crown scorch combined with very severe bark burn or with extensive basal damage, or extensive damage by bark burn alone; (3) in trees damaged by summer fires, complete crown scorch alone, extensive basal damage alone, or very severe bark burn alone. Within these classes, Shortleaf Pine, suppressed trees, and trees < 10 in. in diameter are poorer risks than Loblolly or Longleaf Pine, or trees in the upper crown classes, or trees > 10 in. diameter. A tree in any given class is twice as likely to die when injured in a summer fire.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

552. WARD, E. J. **The effect of certain vegetation eradicators on the inflammability of various materials.** *Tech. Note For. Br. Can.* No. 36, 1956. pp. 10.

Inflammability tests were made, at intervals after treatment, on railway sleepers on plots in the open, in grass-grown plots, and on cloth, all treated with stock solutions of herbicides. Inflammability was increased appreciably by diesel oil and strong solutions of $NaClO_3$, slightly by CMU when the material treated was still wet, and negligibly by 2,4-D compounds and 2,4,5-T. Diesel oil should not be used if fire is not wanted, and $NaClO_3$ only if mixed with $CaCl_2$ at 2/1. To reduce fire hazard, grass and herbaceous growth should be cut in autumn or early spring, spraying should be carried out during the development of new growth, the area should be burnt over when vegetation shows considerable browning, and should then be resprayed to kill new plant growth.

553. **Fire danger build-up.** *Protect. Bull. B.C. For. Serv.* No. 2, 1956. pp. 4.

'Build up' is defined as the accumulated effect of past weather or present burning conditions in heavy fuels. Various methods of assessing this index are briefly described, and a detailed account is then given of a promising method developed by the British Columbia Forest Service. Basically this index (I) consists of $\frac{1}{10}$ of the 8 a.m. moisture-content of the standard $\frac{1}{2}$-in. fuel-moisture sticks plus $\frac{9}{10}$ of the previous day's I. For purposes of computation it can be obtained quite simply by taking the difference between yesterday's I and to-day's 8 a.m. stick moisture, dividing this difference by 10, and adding (or subtracting as the case may be) the figure obtained, to yesterday's value of I in order to obtain a new value for to-day. At the start of the

season, some initial value must be assumed for I, e.g. the average 8 a.m. stick-moisture readings over the past 10 days, but even with a good estimate of the starting I, it will take about two weeks for I to become reasonably accurate. In practice, if I is based on one week's observations it will be ca. 50% accurate; by the time 3 weeks' records are used, it will be ca. 90% accurate. An example is given of the calculations required to compute I.

554. CASTELLANOS, O., and PAPARA, A. Tablas de peligro del fuego. **[Fire-hazard tables.]** *An. Adm. nac. Bosques, B. Aires* 1956 (143–76). [Span.]

Presents tables adapted from those compiled by H. W. Beale for use by the Canadian Forest Fire Service [cf. *F.A.* 8 No. 1384], with recommendations for their application in Argentina.

432. Prevention and Control

See also No. 179.

555. INOUE, K., and MASUDA, H. **[Trees for fire mantle in Hokkaido.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (150–61). 7 refs. [Jap.e.]

Gives results of laboratory tests to compare the resistance of the foliage of 22 broadleaved and 12 conifer species to ignition and bursting into flame. No species ignited at < 350° C.; almost all ignited at 360 480° and burned in 2–3 min. at 750°. Japanese Larch was the most resistant. In regard to ignition times and temperature, the species are divided into coniferous, *Syringa* and *Ginkgo*, and broadleaved groups, in each of which regressions are given. Time to burst into flame (which occurred at 440–600°) was shortest, except for *Pinus densiflora*, among conifers. Spring foliage, on account of water content, is more difficult to ignite than that of autumn. Best species for firebreaks are *Larix leptolepis*, *Picea glehnii*, *Ginkgo biloba*, *Syringa amurensis* and *Cephalotaxus drupacea* var. *nana*.

556. N., H. Skogsbrandbevakning med flyg. **[The use of aeroplanes for detecting and reporting forest fires.]** *Skogen* 43 (13), 1956 (398–9). [Sw.]

Reports on an experiment in Gävleborg county, in which about 6000 sq. km. were patrolled by aeroplane, replacing 11 watch towers. Total flying hours in June–August were 346½. Costs and efficiency of aerial and tower survey are compared and merits discussed. A combination of both will probably be the most satisfactory method. Further experiments are needed.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See Nos. 16–7, 76, 302.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

557. ALLISON, D. V., and RECHENTHIN, C. A. **Root plowing proved best method of brush control in South Texas.** *Journal of Range Management, Portland* 9 (3), 1956 (130–3). From *abstr.* in *Weed Abstr.* 5, 1956 (No. 834). O.R.E.

Chain dragging between tractors, chopping, tree-dozing, root-ploughing and spraying were compared for the control of mixed brush. The principal species were: *Prosopis juliflora*, *Acacia amentacea*, *Condalia* spp., *A. berlandieri*, *Castalia texana*, *Koeberlinia spinosa*, *Celtis pallida*, *Porlieria angustifolia*, *Aloysia ligustrina*, *Schaefferia cuneifolia*, *Leucophyllum frutescens* and *Opuntia* spp. Root-ploughing was done with a heavy V-shaped blade having an iron rod ('kicker bar') welded to each side to turn over the cut brush and expose its roots, and pulled at an average depth of 11 in. behind a crawler tractor. It gave nearly 100% kill of all brush species but appeared to spread *Opuntia*, which was best controlled by tree-dozing. Raking after chain dragging was uneconomic and after ploughing gave much smaller increase in grasses. Chopping was done with a roller chopper weighing 22,000 lb. with blades at 14-in. intervals. These cut some 4 in. into the soil, leaving a furrow that served to catch both seed and rain, and cutting the brush into short lengths that formed a protective mulch. Chopping killed very little brush, and must be repeated in a few years, but where the treated area was re-seeded it gave as good results as root-ploughing at far lower cost.

558. PURRER, W. Die Sichelsäge ('Scy-Saw'). **[The scythe-saw.]** *Allg. Forstztg.* 65 (5/6), 1954 (79). [G.]

A portable mechanical weed-cutter, consisting of a small 2-h.p. petrol motor driving a straight shaft to which can be fitted 3 easily exchangeable tools: viz. a mower, cutting a swath of 52 cm., a rotary cutter to deal with brambles etc. up to ca. 3 cm. stem diameter, and a chain-saw, capable of cutting through stems up to 20 cm. diam. The motor is slung on a shoulder strap.

Weeds: Chemical Control

See also Nos. 360–4, 417, 427–33, 552.

559. **Weed control handbook 1956. Recommendations and information concerning the use of chemical weed-killers.** British Weed Control Council, London. 1956. pp. 130. Price 5*s.* from W. A. Williams, Cecil Chambers, 86 Strand, London, W.C.2. O.R.E.

Includes, among other sections, a classification of weedkillers with notes on those in common use in Great Britain, a section on forest nurseries, recommendations for the use of arboricides and a chapter on the law concerning weeds and weedkillers.

560. **Proceedings of the Lake States aerial brush control meeting and tour, July 26–28, 1955.** *Misc. Rep. Lake St. For. Exp. Sta.* No. 39, 1955. pp. 38.

Includes a description of the test areas visited, short papers on equipment and techniques, and the following longer papers with discussion: Herbicides useful to foresters in aerial brush control (*L. L. Coulter*); The effectiveness of chemical sprays on resistant species (*E. J. Janowski*); Changes in plant communities following spraying, and release effects on conifers (*H. L. Hansen*); Elements of a satisfactory contract for herbicide spraying (*E. J. Adams*).

561. MORAIS, R. **An experiment on the aerial application of herbicides on Mountain Maple.** *Res. Note Causapscal For. Res. Sta.* No. 7, 1956. pp. 3.

Cut-over and uncut plots were sprayed from the air with (*a*) 2,4,5-T, (*b*) Silvex (2,4,5-trichlorophenoxypropionic acid) both at the same rate and concentration, ¼ gal. (1 lb. acid equivalent) herbicide in 1 gal. diesel oil and 3¾ gal. water per acre. Preliminary results, based on degree of defoliation of *Acer spicatum* appear to show great superiority in Silvex. Total costs, including lay-out and marking of plots, were $9·89/acre.

562. BYLTERUD, A. Kjemiske midler mot teinung og ugras. [**Chemical methods of controlling coppice growth and weeds.**] *Norsk Skogbr.* 2 (10), 1956 (333–6). [Nor.]

Surveys methods, equipment and chemicals used in summer and winter spraying of weed trees and weeds in Norway, and gives a table showing the resistance of a number of species, including some deciduous trees and conifers, *Vaccinium* spp., *Calluna vulgaris*, *Rubus* spp., *Rosa* spp., bracken, grasses and woodland herbs, to MCPA, 2,4-D and 2,4,5-T.

563. OWENS, C. B. **Chemical eradication of Turkey Oak.** *Down to Earth, Midland, Mich.* 11 (4), 1956 (23–4). 1 ref. From *abstr.* in *Weed Abstr.* 5, 1956 (No. 642). O.R.E.

Propylene glycol butyl ether esters of 2,4-D and 2,4,5-T, 2,4-D + 2,4,5-T and 2,4,5-TP applied at 4–8 lb./acre as basal spray gave excellent control of *Quercus laevis*; spring applications were better than winter. Foliage applications of 2,4,5-T at 2 lb./acre or 2,4,5-TP at 1 lb./acre gave good control; 2,4-D and 2,4-D + 2,4,5-T were much less effective. Better results were obtained when the carrier was water than when it was oil or oil/water emulsion.

564. ELWELL, H. M., and COX, M. B. **Effect of cutting and herbicidal treatment on control of Oak sprouts.** *Proc. 12th ann. Nth. Cent. Weed Control Conf.* 1955 (63). O.R.E.

Presents results from experiments in annual cutting and in spraying with a butoxy ethanol ester containing ¾ 2,4-D and ¼ 2,4,5-T. Spraying gave a low apparent kill of 1- and 2-year coppice shoots, and a higher apparent kill of 3- or 4-year-old coppice shoots.

565. **[Killing trees by spraying with 2,4,5-T (butyl ester).]** *Rep. For. Dep. Sarawak 1955*, 1956 (19).

Three months after applying a 2% solution in oil to a ring of bark, using a pressure spray at a distance of 2–3 in. for smaller and 6–8 in. for larger trees, 72 of the 100 trees treated, comprising 34 species, were dead and 26 dying. The use of 2,4,5-T proved cheaper than that of Na arsenite.

566. NAUDE, C. P. **Eradication of Lantana and Thorn trees.** *Fmg. S. Afr.* 31 (360), 1956 (209–10). 4 refs. E.M.B.

Paraffin and dieseline solutions of 2,4,5-T (3½ oz. amyl ester in 2 gal. solvent) gave satisfactory control of Lantana and *Acacia karroo*.

567. HENRY, N. B. **Use of 2,4-D and 2,4,5-T for killing small Eucalypts.** In *Res. Notes Qd. For. Serv.* No. 5, 1956. pp. i + 8. 4 refs.

An experiment to assess the relative efficiency of a number of 2,4-D and 2,4,5-T formulations as a means of preventing the development of coppice from small Eucalypts when applied as dilute solutions to frills or cut stumps, is described. Best results were obtained with 2,4,5-T amine salt. Removal of coppice shoots from treated stumps may be of some benefit in increasing the over-all kill. *Author's summary.*

568. MEADLY, G. R. W. **Mesquite (*Prosopis juliflora*).** *Journal of Agriculture of Western Australia, Perth* 5 (1), 1956 (65–6, 69–70, 73–4). From *abstr.* in *Weed Abstr.* 5, 1956 (No. 640). O.R.E.

A history of the spread of *Prosopis juliflora* in Australia is followed by a description of the plant and its undesirable characteristics. If only a few trees occur, they can be destroyed by grubbing below the bud zone. An effective chemical treatment is to spray the basal 2–3 ft. with 2,4,5-T at 1 lb./10 gal., while foliage spraying of seedlings and young plants has proved effective at 3 lb./100 gal. Aircraft spraying has not proved successful. A programme of chain dragging combined with cultivation has been started.

442. Parasitic Higher Plants. Climbers and Epiphytes

See also Nos. 571, 1111.

569. HAWKSWORTH, F. G., and LUSHER, A. A. **Dwarf mistletoe survey and control on the Mescalero-Apache Reservation, New Mexico.** *J. For.* 54 (6), 1956 (384–90). 3 refs.

On the basis of data from 4000 one-tenth-acre plots covering 214,000 acres, the serious effect of *Arceuthobium vaginatum* on the productive capacity of Ponderosa Pine is analysed and mapped. Figures for *A. douglasii* on Douglas Fir are also given. The damage, which has dislocated working-plan prescriptions, is being controlled on 12,000 acres by cutting out infected merchantable trees and felling or pruning poles and saplings, with follow-up operations planned for 6–10 years later. The performance of a 10-man team and costs/acre are given.

443. Fungi and Bacteria

See also Nos. 131–3, 161, 163, 328, 1203, 1217.

570. SORAUER, P. [Edited by APPEL, O. and RICHTER, H.] Handbuch der Pflanzenkrankheiten. Band II. Die Virus- und Bakterienkrankheiten. 2. Lieferung. Bakterielle Krankheiten. Bakteriosen einschliesslich Streptomykosen. [**Manual of plant pathology. Vol. II. Virus and bacterial diseases. No. 2. Bacterial diseases. Bacterioses, including streptomycoses.**] Paul Parey, Berlin. 6th ed. (rev.) 1956. pp. vi + 567. Many refs. [G.] Price [£9. 18*s.*]

571. SPAULDING, P. **Diseases of North American forest trees planted abroad: an annotated list.** *Agric. Handb. U.S. Dep. Agric.* No. 100, 1956. pp. 144.

Contains (1) an annotated list of diseases, (*a*) viruses (three), (*b*) bacteria (four), (*c*) fungi, (*d*) mistletoes (two); (2) index of host plants with their diseases; (3) list of species with countries and localities of plantations; (4) list of locations of plantations.

572. BROWN, A. M. **A check list of plant rusts in Canada.** *Publ. Dep. Agric. Can.* No. 976, 1956. pp. 51. 37 refs.

573. ***Fabraea maculata*** (Lév.) Atk. *Distr. Maps Plant Dis.* No. 327 (rev.) 1956. pp. [2].

Fungi and Bacteria: Natural and Biological Control

See No. 577.

Fungi and Bacteria: Chemical Control

See Nos. 368, 584, 592.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See Nos. 367–70.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 438, 529, 651.

574. GLASER, T., and SOSNA, Z. Badania porównawcze huby korzeniowej (*Fomes annosus* Fr.) pochodączej z sosny świerka i brzozy na sztucznych pozywkach. **[Comparative studies on *Fomes annosus* from Pine, Spruce and Birch grown in culture.]** *Acta Soc. Bot. Polon.* 25 (2), 1956 (285–303). 11 refs. [Pol.e.] O.B.D.

A study of the comparative behaviour of cultures of *F. annosus* derived respectively from (*a*) *Pinus sylvestris*, (*b*) *Picea abies*, and (*c*) *Betula alba* s.l. The highest rate of mycelium growth was found in (*c*) and the lowest in (*a*). The highest % of weight loss in wood of all three species was caused by (*a*) (average 7·7), that for (*b*) and (*c*) being about the same (average 4·5). The highest average increase during a 24-hour period for 4 degrees of humidity on all species of wood was shown by (*b*) and the lowest by (*c*). No correlation was found in any case between rate of growth on artificial media, appearance of fruiting bodies, degree of wood decomposition, and rate of growth of mycelium on wood.

575. BRONCHI, P. Origine dell' abetina pura artificiale nella Foresta Demaniale di Badia Prataglia in relazione ai recenti danni da *Fomes annosus* su *Abies alba*. **[The origin of the pure artificial Silver Fir stands of the state forest of Badia Prataglia in relation to recent *F. annosus* injury to *A. alba*.]** *Monti e Boschi* 7 (8), 1956 (368–73). [It.f.e.]

F. annosus infection in these extensive forests occurs in some young plantations made on felling sites or windthrow areas. Investigation showed that the affected sites were in all cases situated in areas where the preceding forest stand had been planted (during the 19th century) on agricultural land. Similar young plantations in areas originally afforested in the Middle Ages were unaffected. [Cf. *F.A.* 13 No. 3096.]

576. POPULER, C. La pourriture rouge du coeur des résineux (*Fomes annosus* Fr. Cooke): répartition de la maladie dans les pessières ardennaises et essai d'interpretation écologique. **[Red heart-rot of conifers (*F. annosus*): distribution of the disease in the Spruce stands of the Ardennes, and an attempt at an ecological interpretation.]** *Bull. Soc. for. Belg.* 63 (7), 1956 (297–329). 25 refs. [F.]

After a review of the literature on *F. annosus*, the author gives the results of a study of the disease in Spruce stands > 35 years old in the Ardennes. The high plateaux of the region, of which 55,000 ha. carry Spruce stands, are immune to the disease. Below 500 m. the health of Spruce seems to depend largely on soil moisture, the nature of the preceding crop, and the silvicultural treatment. There is evidence of a correlation between *F. annosus* attack and physiological maturity, the latter occurring earlier in proportion to the distance of the Spruce from its optimum environment. The data from the study are analysed statistically and represented graphically.

577. NISSEN, T. V. **Actinomycetes antagonistic to *Polyporus* [*Fomes*] *annosus* Fr.** *Experientia, Basle* 12 (6), 1956 (229–30). 2 refs. [E.g.] O.R.S.

Almost half the actinomycetes isolated from Danish forest soils showed antagonistic effects on *F. annosus* mycelium *in vitro*. One of these (*Streptomyces* sp.), added to sterile soil in laboratory tests, inhibited growth of mycelium of *F. annosus* cultures. The possibility of stimulating the actinomycete flora in forest soil is suggested.

578. LÜCKHOFF, H. A. **Two hitherto unrecorded fungal diseases attacking Pines and *Eucalyptus* in South Africa.** *J. S. Afr. For. Ass.* No. 26, 1955 (47–61). 7 refs.

Gives details of (*a*) a disease of *Pinus taeda* apparently caused by *Stereum sanguinolentum*, a local virulent parasitic strain being postulated, and (*b*) a disease of *P. hondurensis*, *Callitris robusta*, *Eucalyptus paniculata E. punctata* and *E. maculata* ascribed to *Ganoderma colossum*, both in Natal. Extensive root and stem rot is associated with (*a*), while (*b*) causes extensive root and collar rot in the Pine and kills Eucalypts and *Callitris* by a disorder of the root system. The damage and sporophores are illustrated.

579. ZAMBETTAKIS, C. ***Rosellinia necatrix*** **(Hart.) Berl.** *Fiches de Phytopathologie Tropicale, Supplément Colonial de la Revue de Mycologie, Paris* No. 13, 1955. pp. 8. 4 refs. [F.] I.M.I.

Covers synonomy, distribution (4 continents), symptoms, transmission, morphology, biology and control. Among the 40 named hosts of this root parasite of injured or debilitated plants, the forest tree genera are *Acacia*, *Acer*, *Castanea*, *Ficus*, *Juglans*, *Morus*, *Olea*, *Pittosporum*, *Quercus*, *Salix*, and *Ulmus*. Young plantations in clear-felled areas are menaced, and such areas should be cleaned first with annual crops, after complete stump removal. Enrichment planting with poisoning of the old crop

is an alternative. The choice of hosts is reduced in dry soils poor in humus. [Cf. *F.A.* 15 No. 1505.]

Wilts, Diebacks etc

580. KAMEI, S. **[Biological observations on [*Phomopsis*] dieback disease of Firs and Larch in Hokkaido.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (513–22 + 8 photos). 7 refs. [Jap.jap.e.]

Tentatively identified as *P. occulta*, this fungus causes dieback and canker in saplings, and discoloured foliage and drooping branches in seedlings, of *Abies mayriana*, *A. sachalinensis*, and *Larix leptolepis*, on which successful inoculations were obtained. Spruces (2), *Cryptomeria* and Douglas Fir did not develop the disease.

581. CURL, E. A. **Natural availability of Oak wilt inocula.** *Bull. Ill. nat. Hist. Surv.* 26 (3), 1955. pp. 323. 73 refs. [Cf. *F.A.* 15 (No. 1519).]

582. GRISWOLD, C. L. **Interval between Oak wilt fungus inoculation by *Drosophila melanogaster* and appearance of foliar symptoms.** *J. econ. Ent.* 49 (3), 1956 (429). 2 refs.

The indications are that inoculation takes place in the field from spring to autumn and that at least some Oaks developing foliar symptoms in June have been infected in the previous year. [Cf. *F.A.* 15 No. 3743.]

583. PARMETER, J. R., JR., KUNTZ, J. E., and RIKER, A. J. **Oak wilt development in Bur Oak.** *Phytopathology* 46 (8), 1956 (423–36). 22 refs.

An expanded article covering similar ground to that already noted [cf. *F.A.* 16 No. 1918] dealing with the symptoms of *Endoconidiophora fagacearum* attack on Bur Oaks, in which its spread is slower, with a correspondingly limited distribution as compared with the Pin Oaks.

584. DOCHINGER, L. S. **Maple wilt progress report.** *Shade Tree* 29 (6), 1956 (1–3).

In laboratory tests, the fungus grew best at pH 6·0 and 75° F. The toxin believed to cause the wilt was found to be thermo-stable and independent of light for production. It separated in organic solvents into two parts, each dependent upon the other for producing complete wilt symptoms. An accurate method of testing the potency of the toxin, using cucumber seeds, was developed. Experiments in infecting Maple with *Verticillium* spp. isolated from other hosts gave negative results. In a 2-year survey in New England, the disease was found most often on *Acer saccharinum* (8%) followed by *A. platanoides* (2·8%), *A. rubrum* (1·4%) and *A. saccharum* (1·0). No definite relationship could be established between environmental factors (e.g. soil structure, rainfall, temperature, pH) and the variations in prevalence. $AgNO_3$ stain proved suitable for field identification of the fungus. Inoculation of the sapwood caused infection, but inoculation of the leaves, application of the fungus to the bark, and use of infected wood chips as a mulch failed to do so. Pruning tools sometimes transmitted the disease from an infected to a healthy tree. Both spread of infection and callus formation increased with increasing amounts of N fertilizer supplied to plants. Of 175 chemicals tested for controlling the fungus, Actidione, Mathieson 1484, pyridylmercuric acetate, oxyquinoline benzoate and sulphate, and Vancide 51 were the most promising. Submerging Maple cuttings in solutions of chemicals proved an adequate method of testing phytotoxicity. Techniques of tree injection are discussed. [Cf. *F.A.* 16 No. 3143.]

585. DOCHINGER, L. S. **New concepts of the *Verticillium* wilt disease of Maple.** *Abstr.* in *Phytopathology* 46 (8), 1956 (467).

Surveys in 27 New Jersey localities showed the following order of infection incidence: *A. saccharinum*, *A. platanoides*, *A. rubrum*, *A. saccharum*, a total of 3·4% of the trees. Potted plants of Norway Maple supplied with complete nutrient, varying only in amounts of N, showed that, with increased N, callus formation and the upward extension of fungal discoloration increased. Axes, saws and borers used on infected trees of the same species transmitted the fungus into the sapwood of other trees in 10% of cases.

Cankers, Stem Rusts etc.

See also Nos. 110, 580, 704.

586. BANERJEE, S. **An Oak (*Quercus robur* L.) canker caused by *Stereum rugosum* (Pers.) Fr.** *Trans. Brit. mycol. Soc.* 39 (2), 1956 (267–77 + 2 plates). 20 refs. O.B.D.

A destructive Oak canker in Peebleshire was found to be caused by *S. rugosum*, hitherto unreported from Scotland. The cankers, which were found on stems of trees ca. 50–60 years old growing on a damp and shady site, are mostly open with a depressed hollow centre surrounded by a prominent callus ridge. The fructifications of *S. rugosum* have been found at the edge or near the centre, on the surface of the dead bark, usually round the stub of a dead branch. The microscopic characters of the rot and chemical changes in the wood during the process of decay are examined. *S. rugosum* was obtained in pure culture from areas of both advanced and incipient decay, and also from spores. Inoculations made on the wounded bark of the stem of a healthy Oak, using mycelium as the inoculum, were positive. Laboratory studies showed that *S. rugosum* is able to attack sapwood much more readily than heartwood. *From author's summary.*

587. ARSDEL, E. P. VAN, RIKER, A. J., and PATTON, R. F. **The effects of temperature and moisture on the spread of White Pine blister rust.** *Phytopathology* 46 (6), 1956 (307–18). 16 refs.

Defines the limiting conditions of heat and moisture for the development and viability of the spores of *Cronartium ribicola* under greenhouse and field conditions. [Cf. *F.A.* 15 No. 1534.]

588. HIRT, R. A. **Fifty years of White Pine blister rust in the Northeast.** *J. For.* 54 (7), 1956 (435–8). 11 refs.

Traces the history of the introduction from Europe into North America of *Cronartium ribicola* and of attempts to control this disease of 5-needle Pines, now found from east to west across the continent. Properly sited and managed plantations

of White Pine can be raised without excessive cost in the North-east despite the disease.

589. MIELKE, J. L. **The rust fungus (*Cronartium stalactiforme*) in Lodgepole Pine.** *J. For.* 54 (8), 1956 (518–21). 9 refs.

The large cankers, often > 30 ft. long, caused by this native pathogen are described and illustrated for the first time. Severe timber degrade results, but no associated decay has been observed. The only known method of reducing losses, the extent of which is too little appreciated in the Intermountain and Rocky Mountain Regions because rodents devouring the infected bark have masked the real cause, is to remove the diseased trees.

590. VANDERWALLE, R. Note sur l'étiologie du chancre du Peuplier. **[The etiology of bacterial canker of Poplar.]** *Parasitica, Gembloux* 9 (4), 1953 (119–24). 4 refs. [F.] I.M.I.

Experiments in the inoculation of Poplars with different types of filtrate of the canker exudates, indicated that although the formation of cankers is connected with one or more organisms present in the lesions, for successful inoculation the presence is necessary of toxic substances derived from the sap of the Poplar under the action of the microflora present in the sap. [Cf. *F.A.* 15 No. 3755–6.]

591. Le *Dothichiza* du peuplier: moyens de lutte préconisés. **[*Dothichiza populea*: recommended methods of control.]** *Bull. Soc. for. Belg.* 63 (7), 1956 (330–40 + 2 plates). [F.]

Official recommendations on nursery sanitation, packing and transport of nursery stock, planting and tending, in order to prevent the spread of the disease.

592. WÖSTMANN, E., and GOOSSEN, H. Bekämpfungsversuche gegen *Dothichiza populea* mit Fungiziden. **[Trials of fungicides against *D. populea*.]** *Forst- u. Holzw.* 11 (17), 1956 (371–2). [G.]

Captan, zineb, 2 Cu, and 1 Hg preparation were sprayed repeatedly at varying times throughout the summer on a nursery site stocked with Poplars [not further specified] planted as cuttings in the previous year. The Cu preparations impeded growth, the Hg spray caused abnormal branching, but both gave good control and are recommended in 2 or 3 sprayings from late June to early August.

593. WETTSTEIN, W. Résultats de l'enquête sur *Dothichiza populea*. Autriche. Observations faites dans les différentes provinces fédérales. **[Results of the enquiry on *D. populea*. Austria. Observations made in the different provinces.]** [*Pap.*] *int. Poplar Comm.* No. *FAO/CIP/MAL/2-B*, 1956. pp. 1. [F.] Limited distribution.

594. SANZ PASTOR, J. M. Résultats de l'enquête sur *Dothichiza populea*. Réponse au questionnaire FAO/CIP/MAL/ 1 sur le *Dothichiza populea* Sacc. et Briard (= *Condroplea populea* Kleb.) et renseignements sur quelques autres chancres du peuplier dus à des champignons ou à des bactéries. **[Results of the enquiry on *D. populea*. Spain. Reply to the questionnaire FAO/CIP/MAL/1 on *D. populea* and information on some other cankers caused by fungi or bacteria.]** [*Pap.*] *int. Poplar Comm.* No. *FAO/CIP/MAL/2-C*, 1956. pp. 1. [F.]

595. MEYNEKE, C. A. R., and TACONIS, P. S. **Results of the enquiry on *Dothichiza populea*. Netherlands. A preliminary report on the influence of some important factors on the *Dothichiza* disease of young Poplars.** [*Pap.*] *int. Poplar Comm.* No. *FAO/CIP/MAL/2-A*, 1956. pp. 4 + 1 tbl. Limited distribution.

The % of young trees attacked in plantations depended chiefly on nursery conditions, treatment at transplanting, and site factors, mainly soil profile. *Populus deltoides* var. *missouriensis* proved highly susceptible, × *P. gelrica* and × *P. serotina erecta* highly resistant.

596. TARIS, B. Première mise au point des recherches accomplies en France sur les maladies cryptogamiques du peuplier. **[A preliminary report on studies of Poplar diseases in France.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO/56/24/102*, 1956. pp. 12. [F.]

Includes notes on lay-out and technique of experimental study of *Dothichiza populea* and *Cytospora chrysosperma*, covering artificial inoculation, meteorological factors, method of infection, resistant and susceptible strains of Poplar, and work both in plantations and in the laboratory.

597. TARIS, B. Résistance au froid du mycélium de *Dothichiza populea* Sacc. et Briard et de *Cytospora chrysosperma* (Pers.) Fr. **[Resistance to cold of mycelium of *D. populea* and *C. chrysosperma*.]** *C.R. Acad. Sci., Paris* 242 (12), 1956 (1648–9). [F.] O.R.S.

Cultures of mycelia of these fungi grew normally when transplanted and kept at room temperature after subjection to temperatures as low as — 35° C. for periods up to 10 days. Growth on × *Populus robusta* of mycelium subjected to — 35° was equal to that of controls.

598. RÄDER-ROITZSCH, J. E. Beobachtungen über das Auftreten der *Cytospora*-Krankheit an Jungpappeln. **[The occurrence of *Cytospora chrysosperma* on young Poplars.]** *Schweiz. Z. Forstw.* 107 (8/9), 1956 (490–503). 6 refs. [G.g.f.]

Discusses possible causes of mass infections of 2-year planting stock of × *Populus serotina*, developing at many different sites in Bavaria. No obvious mistakes in tending or transport could be found, and 1-year plants at the supplying nursery showed no symptoms. From examination of roots and root collars, and preliminary experiments on the germination of *Cytospora* spores in soil, root infection from infected soils is considered the most likely cause.

Foliage Diseases

599. LYR, H. Untersuchungen zur Pathologie der Douglasie. **[Researches on the pathology of Douglas Fir.]** *Arch. Forstw.* 4 (5/6), 1955 (533–44). 40 refs. [G.]

A report on the current work at Eberswalde on the two most important fungal diseases, the obligatory parasite *Rhabdocline pseudotsugae* and the facultative *Phaeocryptopus gaeumannii*. It has proved possible

to culture artificially only the latter, and details of its physiology are given. The superior resistance of the *viridis* form of Douglas is affirmed, and the site conditions favourable to needle-cast and a map of E. Germany showing the distribution of the pathogens are given. [Cf. *F.A.* 17 No. 315.]

600. HENNIGS, V. Beobachtungen zur Kiefernschütte, 1955. **[Observations on *Lophodermium pinastri*, 1955.]** *Forst- u. Holzw.* 11 (5), 1956 (100–2). 2 refs. [G.]

Describes the incidence of the disease, which was heavy but erratic, in the Lüneburg district in 1955, and discusses the reasons for success and failure of previous sprayings.

601. BIRAGHI, A. **Occurrence of *Thyriopsis halepensis* on [Aleppo] Pine in Italy.** *FAO Plant Prot. Bull.* 4 (3), 1955 (38–40). 3 refs.

This facultative parasite, already reported from France and Transcaucasia, was found as a parasite only in the moist-air conditions of one congested stand of *P. halepensis* in Tuscany. Symptoms were: very severe defoliation; older needles ringed with black-dot perithecia and falling at a touch; young needles persistent; branch dieback in some stems; no abnormal root condition. On neighbouring well-spaced *P. pinea* the fungus was merely saprophytic.

602. CREELMAN, D. W. **Spot anthracnose of Linden.** *Mycologia* 48 (4), 1956 (552–7). 2 refs. P.R.

Spot anthracnose of *Tilia europaea*, discovered in Nova Scotia in 1954, is described as a new disease, the pathogen being a hitherto undescribed species of *Elsinoe*, now named *E. tiliae*.

444. Virus Diseases

See Nos. 83, 571.

45. Damage by Animals

See also No. 1203.

451. Mammals

See also Nos. 73–5, 378.

603. JAMES, G. A. **The rodent problem on cut-over areas in southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 31, 1956. pp. 2. 1 ref.

Results of trapping in clear-felled areas in 1954 and 1955 showed that potentially dangerous populations of white-footed mice (*Peromyscus*) and shrews (*Sorex*) were present.

604. KINOSHITA, E. **[Studies on the mechanical control of field mice. IV. On the effect of control of field mice by trench.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (50–63). 11 refs. [Jap.jap.e.]

Girdling and half-girdling by mice affected 8·4 and 3% respectively of the Larch stems outside a trench-protected area, with no damage inside. Some details are included of the biology of *Clethrionomys rufocanus bedfordiae*.

605. LAVENDER, D. P., and ENGSTROM, W. H. **Viability of seeds from squirrel-cut Douglas Fir cones.** *Res. Note Ore. Bd. For.* No. 27, 1956. pp. 19. 4 refs.

To determine if squirrels (*Sciurus douglasii*) cut cones before the seeds are ripe, a series of collection points was established in the Willamette Valley and the Cascade Mountains in summer 1954. The areas were inspected at intervals during Aug., Sept. and Oct. 1954, and freshly cut cones gathered whenever they appeared. These were air dried and the seeds extracted and cleaned by hand. Results of laboratory and greenhouse germination tests indicated that the squirrels cut cones in quantity only when the seeds were ripe, and the seeds showed no significant increase in viability with later dates of cutting. *From authors' summary.*

606. SACHS. Billigerer Fegeschutz mit Aluminiumfolie. **[Cheaper protection against deer damage by using aluminium foil.]** *Forst- u. Holzw.* 11 (6), 1956 (119–20). [G.]

Thin, light strips of aluminium foil wound round young Larches and Douglas Firs, gave good protection at low cost.

607. JASCHT, E. Der Schälfangbaum. **[The barking trap tree.]** *Allg. Forstztg.* 65 (19/20), 1954 (245). [G.]

Felled, barked Spruce trees, stacked high, near a game track, gave considerable protection against barking to surrounding standing trees, as the deer relished the phloem and spent much time gnawing it off.

608. GEIL. Praktische, wirksame und billige Schälschutzverfahren nach den neuesten Versuchsergebnissen. **[Cheap, practical and effective means of controlling bark scaling by deer, based on recent research.]** *Forst- u. Holzw.* 11 (17), 1956 (376–8). [G.]

Describes a bark incisor roller, made in two sizes, for use on Beech and other broadleaved or coniferous species. This, contrary to earlier methods, achieves the formation of deer-repellent wound callus without cutting right through the bark, thus avoiding possible injury to the trees. Incising in spring should prevent summer scaling, as callus formation takes only 6–8 weeks.

609. WEBB, W. L., KING, R. T., and PATRIC, E. F. **Effect of white-tailed deer on a mature southern hardwood forest.** *J. For.* 54 (6), 1956 (391–8). 5 refs.

In the Huntingdon Wildlife Forest, New York [cf. *F.A.* 10 No. 2514], where *Odocoileus virginianus* densities have fluctuated from 1/19·4 to 1/34·4 acres, the effect of 15 years' exclusion on the regeneration and growth of *Acer saccharum*, *Betula lutea*, *Fagus grandifolia*, *Fraxinus americana*, and other woody and herbaceous plants, is analysed and discussed. These populations, probably at the full carrying capacity of the range, have had very little effect on forest growth.

610. CAMPBELL, D. A. **Aerial distribution of fencing materials on hill country in New Zealand.** *Soils & Fertil.* 19 (4), 1956 (305–6 + 1 plate). 1 ref.

Describes experiments in dropping bundles of steel or wooden posts and battens and coils of wire from aircraft, and comparative weight, damage, and cost of wood and steel respectively. Material

for a standard galvanized steel fence weighs 5 tons/mile, compared with 12 tons for wood and 18 for concrete.

611. HISLOP, J. A. **Elephants and electric fences.** *Oryx* 3 (5), 1956 (255–8). 1 ref.

[Cf. *F.A.* 15 No. 440.] Includes E. O. Shebbeare's advice on posts, insulators, wire, tension etc., from Malayan experience. These fences may exclude elephant for some years (2–4) and then regularly fail. Each case requires its own solution, range, incidence and distribution of natural fodder and topography being important. It is practically impossible to bar a regular migration route.

453. Insects

See also Nos. 61–72, 133, 163, 171, 187, 528–30, 1171, 1203, 1217.

612. **Annual review of entomology.** Annual Reviews Inc., Stanford, Calif. Vol. 1, 1956. pp. 466. Price $7·50 [60*s.*]

Includes review articles on: Insect nutrition (*H. Lipke* and *G. Fraenkel*); Soil insects and their control (*J. H. Lilly*); Apparatus for application of insecticides (*J. L. Braun, Jr.*); Ecology of forest insects (*S. A. Graham*); The fundamental theory of natural and biological control (*W. R. Thompson*); and Effect of pesticides on balance of arthropod populations (*W. E. Ripper*).

613. GARDNER, J. C. M. **Forest entomology in East Africa.** *E. Afr. agric. J.* 22 (1), 1956 (1–2).

A review of the work done in co-operation with the Kenya, Tanganyika and Uganda forest departments since 1950, the most important pests so far noted being named.

614. GÄBLER, H. Forstliche Samenschädlinge und ihre Bedeutung. **[Seed pests of forest trees and their importance.]** *Arch. Forstw.* 4 (5/6), 1955 (434–8). 3 refs. [G.]

Notes on insect pests of the flowers and seeds of forest trees in Germany, with some notes on control. The following hosts receive mention: Willow, Poplar, Birch, Oak, Beech, Hazel, *Acer* sp., Ash, Spruce, Douglas and Silver Fir, and Pine.

615. REID, R. W. **Coniferous seed and cone insects found in Alberta and the Rocky Mountain National Parks.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (3).

Lists 14 species with host tree and collection area.

616. ČERVEŇÁK, J. Príspevok k poznaniu hmyzových škodcov žalud'ov na Slovensku. **[Insect pests of acorns in Slovakia.]** *Les, Bratislava* 2 (11), 1955 (480–6). 12 refs. [Slovak.slovak.]

Results of tests in 1954 showed the following descending sequence in the incidence of insect damage: *Quercus cerris*, *Q. sessiliflora* and *Q. pubescens*, while no acorns of *Q. rubra* were found to be attacked. The commonest pests found were larvae of *Callirhytis glandium* and *Laspeyresia splendana.*

617. SCHWERDTFEGER, F. Internationale Zusammenarbeit zur Vorausschau neuer Insektenschäden in der Forstwirtschaft. **[International co-operation in predicting future insect damage in forestry.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/24/24, 1956. pp. 5. [G.]

Surveys the possibilities of preventive research into the susceptibiliy of exotics to indigenous pests and of indigenous or exotic species to foreign pests that might be accidentally introduced, and the problems involved.

618. JOHNSON, E. W. **Role of aircraft in forest-pest control.** *Scientific Monthly, Washington, D.C.* 79 (6), 1954 (379–91). 33 refs. L.S.

A survey of the problems peculiar to forest-pest control and the application of aircraft both to pest surveys and to aerial spraying and dusting, with numerous practical examples. Various scouting and mapping techniques, e.g. the use of an operations recorder [cf. *F.A.* 13 No. 3162] and of aerial photography (as yet of limited usefulness), types of aircraft, of spraying apparatus and chemicals are described, and their costs and limitation to certain types of pests are discussed.

619. SCHWERDTFEGER, F. Grundsätzliches zur Populationsdynamik der Tiere, insbesondere der Insekten. **[Basic problems of population dynamics in animals, particularly in insects.]** *Allg. Forst- u. Jagdztg.* 125 (6), 1954 (200–8). 42 refs. [G.e.]

Discusses the basic concepts, such as latency and outbreak, suggesting some changes in terminology, and the various biotic and abiotic factors involved (e.g. questions of coincidence, or constitution of host or pest), on the basis of (mostly German) literature and some personal observations.

620. VOÛTE, A. D. **Forest entomology and population dynamics.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford* No. *IUFRO*/56/24/2, 1956. pp. 12 + 1 dgm. 34 refs. [E.]

A general discussion and review of literature.

621. ITO, Y., and MYASHITA, K. **Some considerations on the factors affecting the fluctuations of insect populations.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/25, 1956. pp. 3 + 2 gphs.

Adduces data from the study of agricultural pests, in support of the theory that insect populations fluctuate regularly, and that the relative value of mortality factors varies with density of population.

622. THALENHORST, W. **Other aspects of population dynamics.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/19, 1956. pp. 11. 17 refs. [G.]

Discusses, with reference to literature, some effects of weather, food supply, over-population, and genetic factors in forest insect populations.

Insects: Natural and Biological Control

See also Nos. 612, 636, 642, 648, 653, 656, 659, 663, 679, 684, 692.

623. FRANZ, J. Die Erfolgskontrolle bei der biologischen Schädlingsbekämpfung. **[Checking**

results of biological control measures.] *Allg. Forst- u. Jagdztg.* 125 (6), 1954 (193–9). 44 refs. [G.e.]

A survey of field and laboratory methods used to appraise results in the biological control of forest pests (chiefly insects) through predators, parasites, and diseases, and the difficulties involved.

624. HASEGAWA, K., and KOYAMA, R. **Forest insects' pathogens in Japan (epizootic).** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/7, 1956. pp. 3.

A list of fungi, viruses, bacteria etc., with their host insects.

625. FRANZ, J., and KRIEG, A. Virosen von Forstinsekten. [**Virus diseases of forest insects.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/24/5, 1956. pp. 6. [G.]

A review article, without exact references to the literature, dealing with diagnosis, specificity, resistance, the effects of population fluctuations and physical factors, transmission, and use for biological control, with tabulated data of 10 virus diseases of European forest insects described in some detail in the literature.

626. WELLENSTEIN, G. Ergebnisse 25-jähriger Grundlagenforschung zur forstlichen Bedeutung der roten Waldameise (*Formica rufa* L.) [**25 years of fundamental research into the importance for forestry of *F. rufa*.**] *Mitt. biol. ZentAnst., Berl.* No. 75, 1953 (125–36). [G.]

A discussion, on the basis of literature and the author's own investigations, dealing *inter alia* with numbers and distribution by species of the animals preyed upon, and the damage done to forest trees by aphids and coccids fostered by the ants. Some damage occurs, e.g. by *Lachnus pineti*, but it is usually not serious.

627. GIBB, J., and BETTS, M. M. **Predation by birds on forest insects.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/6, 1956. pp. 5. 9 refs.

Gives some results of studies made in the Pine plantations of Thetford Chase, E. Anglia. Tits are unlikely to be important in the control of insect numbers at high densities, but in winter, when insect foods are often sparse, they may eat a higher proportion of certain insects than in summer. They are shown to have eaten ca. 55% of larvae of *Enarmonia* (*Laspeyresia*) *conicolana* in one winter. *From authors' summary.*

628. RUPPERT, K. Neue Erkenntnisse auf dem Gebiet der Flächendichtesteigerung der Nutzvögel in der Forstwirtschaft. [**Recent results in increasing the nesting density of birds useful to forestry.**] *Mitt. biol. ZentAnst., Berl.* No. 75, 1953 (41–5). [G.]

In 75 ha. of woodland near Frankfurt, with 25 boxes for hole-nesters and 25 'aids' [unspecified] per ha. for tree-nesting species, mean density was, 34·6, with a local maximum of 53. In a larger area with 10 nesting places of each kind per ha., it was 10·8, both figures higher than what had been considered possible. Availability of water is important for greater density and variety of species, particularly in conifer stands.

Insects: Chemical Control (General)

See Nos. 384, 612, 618, 629, 631, 635, 649–50, 659, 662, 666–7, 692, 695.

Isoptera

See No. 334.

Thysanoptera

629. MARTIGNONI, M. E., and ZEMP, H. Versuch zur Bekämpfung des Lärchenblasenfusses *Taeniothrips laricivorus* Kratochvíl und Farský (Thripidae, Thysanoptera) mit einem systemischen Insektizid. [**Trials with a systemic insecticide to control *T. laricivorus*.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 32 (1), 1956. pp. 22. 16 refs. [G.f.it.]

Describes experiments in a 14-year-old Larch trial plot with Metasystox (a 50% emulsion of two isomers of dimethylethylmercaptoethylthiophosphate) applied on bands of absorbent cotton, covered with plastic, to the cleaned bark in concentrations of 2·5% and 5% active ingredients, in early July 1955. The results, measured by the degree of bark injury on shoots in the tops, by the condition of terminal buds and leading shoots, and by height growth, were satisfactory, particularly for the stronger concentrations, which gave complete control for trees of 2–13 cm. d.b.h. and 3–10 m. height. Provenances of varying susceptibility to attack reacted equally favourably. No phytotoxic effects were noted. As suppressed or heavily shaded trees are not attacked, only trees likely to form the final crop need to be treated.

Hemiptera

630. SORAUER, P. [Edited by BLUNCK, H.] Handbuch der Pflanzenkrankheiten Band V. Tierische Schädlinge an Nutzpflanzen. 2. Teil. 3. Lieferung. Heteroptera, Homoptera 1. Teil. [**Manual of plant pathology. Vol. V: Animal pests of useful plants. Part 2, No. 3. Heteroptera, Homoptera part I.**] Paul Parey, Berlin. 1956. pp. ii + 399. Many refs. [G.] Price [£7. 8*s.*]

Does not include Aphidoidea and Coccoidea. [Cf. *F.A.* 15 No. 3813.]

631. KERR, T. W., JR. **Control of the Pine spittlebug and the Pine needle miner.** *J. econ. Ent.* 49 (3), 1956 (426). 1 ref.

In Rhode Island *Aphrophora parallela* and *Exoteleia pinifoliella* are particularly abundant on *Pinus rigida*. The former has also been found on Scots, Red and Jack Pines, the latter on Jack Pine. DDT, methoxychlor, dieldrin, lindane and malathion effectively controlled the nymphal stage of *A. parallela*. For the prevention of attack by the larvae of *E. pinifoliella*, dieldrin, particularly in its residual action, was the most effective (malathion was not tested).

632. INOU(Y)E, M. Beiträge zur Kenntnis der Koniferen-Läuse, vorkommend im nördlichen Teil Japans. [**The Aphididae and Eriosomatidae of the northern parts of the Japanese Archipelago.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (204–38). 129 refs. [G.g.jap.]

A revised edition of a previously published work, covering for these families the same kind of information as that given for the Adelgidae [see *F.A.* 15 No. 3792]. Of the 23 species studied, 15 are *Cinara* spp. The area concerned extends from northern Honshu to the (Russian) Kuriles and Sakhalin.

633. TAKAI, M. **[The result of chemical control experiment of Ezo-spruce [*Picea jezoensis*] gall aphid, *Adelges japonicus* (Monzen) in egg stage.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (31–49). 18 refs. [Jap.jap.e.e.]

Tables show the results of dipping shoots carrying egg masses for 10, 30 and 60 seconds, in spring or autumn, in one of 6–7 concentrations of 7 insecticides. In the spring, (*a*) nicotine sulphate (1/2000) gave 80% mortality, (*b*) derris/BHC emulsion (γ BHC 5%, rotenone 10%) and (*c*) BHC emulsion (γ BHC 10%) each gave nearly 100% mortality (killed eggs and unhatched larvae) at concentrations from 1/100–1/800. Only (*a*) and (*b*), at high concentrations, were effective in the autumn.

634. VARTY, I. W. ***Adelges* insects of Silver Firs.** *Bull. For. Comm., Lond.* No. 26, 1956. pp. iv + 75 + 70 photos. 157 refs. Price 8*s.* 6*d.*

Replaces Bulletin No. 7, long out of print, and contains the following chapters: (1) Taxonomy (including a note on the application of paper chromatography to taxonomy). (2) Life histories of *Adelges nüsslini* and *A. piceae*. (3) The reaction of the tree to attack by *A. nüsslini* and *A. piceae*. (4) Forest relations (forest status and distribution in Britain of the *Adelges* of Silver Fir, and silvicultural aspects). The appendices deal with meteorological data, estimation of chlorophyll content in leaves of *Abies alba* attacked by progredients of *A. nüsslini*, technique of sugar estimation, technique of N estimation for leaves of *Abies alba*, and measurement of pH in *Abies* spp.

635. ZWÖLFER, W. Zum Stand des Auftretens der bösartigen Tannenlaus, *Dreyfusia nüsslini* C.B. in Bayern. **[*D. nüsslini* infestation in Bavaria.]** *Allg. Forst- u. Jagdztg.* 125 (6), 1954 (191–2). [G.e.]

Describes the history and local incidence of *D. nüsslini* in Bavaria, where most of the damage has occurred in sites unsuitable to Silver Fir outside its natural range, or where wrong silvicultural treatment had led to greater susceptibility. Chemical control with DDT was a failure, BHC and lindane-type preparations, a moderate success; systemic insecticides of the Systox type gave good results.

636. PSCHORN-WALCHER, H., and ZWÖLFER, H. Neuere Untersuchungen über die Weisstannenläuse der Gattung *Dreyfusia* C.B. und ihren Vertilgerkreis. **[Recent investigations on Fir aphids of the genus *Dreyfusia* and their predator and parasite complex.]** *Anz. Schädlingsk.* 29 (8), 1956 (116–22). 11 refs. [G.]

Describes central European *Dreyfusia* species, their ecology, population dynamics and predator and parasite complex.

637. KLOFT, W. Die Bedeutung einiger Pflanzenläuse in der Lebensgemeinschaft des Waldes. **[The role of some aphids and coccids in the forest biocoenosis.]** *Mitt. biol. ZentAnst., Berl.* No. 75, 1953 (136–40). 12 refs. [G.]

Discusses their role as suppliers of honeydew, not only for ants but also for bees and parasitic hymenoptera etc. Species visited by ants, e.g. bark aphids of Coniferae, generally do no harm to their hosts (this is probably also true for *Lachnus exsiccator* and *L. roboris*). Injurious aphids, such as *Dreyfusia* spp. or *Phyllaphis fagi*, are not visited by ants.

638. ČERVEŇÁK, J. Kalamitný výskyt červca *Eulecanium rufullum* (*pulchrum*) na východnom Slovensku. **[Mass outbreak of *E. rufullum* (*pulchrum*) in eastern Slovakia.]** *Les, Bratislava* 2 (9), 1955 (383–6). [Slovak.]

Investigations made in Feb. 1955 in a 60-year Oak stand near Pavlovce nad Uhom, dusted in Sept. 1954 from aircraft with a DDT preparation against *Tortrix* spp., showed a mass outbreak of *E. rufullum* and *Euproctis chrysorrhoea*, and also large numbers of *Lymantria dispar*. Sampling indicated an average number of 19·8 larvae of *E. rufullum* per sq. cm. of bark surface on twigs, as compared with only 6·1 for older twigs of the same diameter.

Lepidoptera

See also Nos. 217, 616.

639. BURMANN, K. Kleinfalterraupen an Pappeln in Nordtirol. **[Lepidopterous larvae on Poplars in the northern Tirol.]** *Anz. Schädlingsk.* 29 (9), 1956 (145–6). [G.]

Lists 45 species, with locality and host.

640. GEORGOPULOS, A. Pappelschädlinge in Griechenland — zugleich ein Beitrag zur Biologie von *Sciapteron tabaniforme* und *Melanophila decastigma*. **[Pests of Poplar in Greece, with notes on the biology of *S. tabaniforme* and *M. decastigma*.]** *Anz. Schädlingsk.* 29 (8), 1956 (127–31). 16 refs. [G.]

An annotated list of pests, with fuller notes on *S. tabaniforme* and *M. decastigma* and their control.

641. KLUG, W. Die Balsampappeln als Fangbäume. **[Balsam Poplars as trap trees.]** *Allg. Forstztg.* 65 (11/12), 1954 (155–6). [G.]

The author's suggestion is based on an observation made on individual trees of *Populus simonii*, interspersed in stands of × *P. robusta* and *P. angulata*. The former were heavily infested with *Saperda carcharias* and *Cossus cossus*, and were riddled with woodpecker holes from base to man's height, while the latter were hardly affected.

642. MARTIN, J. L. **The bionomics of the Aspen blotch miner, *Lithocolletis salicifoliella* Cham. (Lepidoptera: Gracillariidae).** *Canad. Ent.* 88 (4), 1956 (155–68). 10 refs. O.R.S.

L. salicifoliella appeared in infestation proportions in Ontario in 1944. By 1951 it had spread over the whole of Ontario, Manitoba, Saskatchewan and part of Quebec. Since then it has declined to a level of minor importance. The preferred host in Ontario was *Populus tremuloides*, but it has occasionally been found on *P. grandidentata*, *P. balsamifera* and *Salix* spp. Foliage below 10 ft. in height on

trees < 4 in. d.b.h. growing on flat terrain, in partially shaded, open, or fringe situations, suffered the greatest injury. Larval competition caused 53% and parasitization 36% of the mortality of the 1954 generation in the Sault Ste. Marie district. Nine species of hymenopterous parasites were recovered. *From author's summary.*

643. STARK, R. W. **Sampling for Lodgepole needle miner eggs.** *Bi-m. Progr. Rep. Div. For. Biol Dep. Agric. Can.* 12 (3), 1956 (3).

Distribution of *Recurvaria milleri* eggs within the tree was found to correspond with larval distribution, and therefore the sampling method derived for larvae [cf. *F.A.* 14 No. 2452] is deemed adequate for egg populations. For any one area, the average number of eggs laid per needle is relatively constant between tips, crown level, and trees.

644. PRENTICE, R. M. **The life history and some aspects of the ecology of the large Aspen tortrix, *Choristoneura conflictana* (Wlkr.) (n.comb.) (Lepidoptera: Tortricidae).** *Canad. Ent.* 87 (11), 1955 (461–73). 15 refs. O.R.S.

The results of a study carried out in Manitoba and Saskatchewan from 1951 to 1954. The insect occurs in N. America throughout the range of its principal host tree, *Populus tremuloides. From author's summary.*

645. FORBES, R. S.; CUMING, F. G.; CARROLL, W. J. **The Spruce budworm in the Atlantic region in 1955.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (1–2).

Separate reports on (1) New Brunswick and Prince Edward Island, (2) Nova Scotia, and (3) Newfoundland, where the first recorded severe outbreaks are developing.

646. GRAHAM, S. A. **Hazard rating of stands containing Balsam Fir according to expected injury by Spruce budworm.** *Mich. For.* No. 13, 1956. pp. 2.

The increase of Spruce budworm in Michigan and Minnesota has prompted attempts to provide a simple stand classification into 5 easily recognized hazard classes based on quantity and age of Balsam Fir.

647. SHEPHERD, R. F. **Effect of wind on Spruce budworm.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (4).

Notes on reductions in budworm larval populations after strong winds.

648. HOUSE, H. L., and BARLOW, J. S. **Nutritional studies with *Pseudosarcophaga affinis* (Fall.), a dipterous parasite of the Spruce budworm, *Choristoneura fumiferana* (Clem.). Effects of various concentrations of the amino-acid mixture, dextrose, potassium ion, the salt mixture, and lard on growth and development; and a substitute for lard [for laboratory breeding.]** *Canad. J. Zool.* 34 (3), 1956 (182–9). 7 refs. O.R.S. [Cf. *F.A.* 17 No. 620.]

649. DAVIS, J. M., *et al.* **Experimental airplane spraying for Spruce budworm control.** *J. econ. Ent.* 49 (3), 1956 (338–41).

Atomizations of 300, 150 and 80μ of DDT in oil, were applied at $\frac{1}{4}$, $\frac{1}{2}$ and 1 lb./gal./acre when most larvae were (*a*) at the 3rd instar and (*b*) in the 4th and 5th instars. DDT deposit and budworm mortality were sampled on 10 Balsam Fir trees in each of 20 test plots in a Spruce/Fir stand in the Laurentid section of Quebec. Stage (*b*) is the better time for maximum kill, for which the minimum dosage is 1 lb. DDT/acre. The 150μ atomization was the most consistently effective. To effect a 95% mortality in stage (*b*), the average deposits of the 300, 150 and 80μ sprays were determined at 0·22, 0·11 and 0·26 lb. DDT/acre, respectively.

650. MACDONALD, D. R. **Effects of Spruce budworm spraying on populations of miscellaneous insects.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (1).

An experiment was carried out in New Brunswick to determine the usefulness of glass barrier flight traps to compare residual populations of miscellaneous insects in sprayed and unsprayed areas. The results showed that they provide a useful means of measuring gross changes in insect abundance.

651. STILLWELL, M. A., and REDMOND, D. R. **Decay in Balsam Fir arising through Spruce budworm injury.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (1–2).

Severely injured trees often have, in addition to a band of narrow annual rings, deformations of the trunk in the form of forks, crooks, or sweeps. Stem analysis showed that these deformities originated at the base of dead tops, and a study of annual rings showed that considerable top-killing and dying-back of extremities of branches occurred during the 1912–20 outbreak of this insect in northern New Brunswick. In 60 trees examined, decay was invariably present if a dead top possessed $\geqslant$ 5 annual rings or was $\geqslant$ 0·5 in. in diameter. An analysis of root systems was conducted on trees that had lost their current foliage for 3 successive years in the present budworm outbreak. In the 4th year, rootlet mortality, was > 75% and some roots of $\geqslant$ 2 mm. were dead. Decay was found in some roots of all trees surviving the 1912–20 outbreak, but only ca. 3% of these infections could be traced to dead roots resulting from budworm injury, and such infections were never the only source of root rot in the tree.

652. MACALONEY, H. J., and DROOZ, A. T. **The Jack Pine budworm [*Choristoneura pinus*].** *For. Pest Leafl. U.S. For. Serv.* No. 7, 1956. pp. 4. 5 refs.

653. DROOZ, A. T., and BENJAMIN, D. M. **Parasites from two Jack-Pine budworm [*Choristoneura pinus*] outbreaks of the Upper Peninsular, Michigan.** *J. econ. Ent.* 49 (3), 1956 (412–3). 5 refs.

Names 3 dipterous parasites of the late-instar larvae, and 9 hymenopterous and one dipterous parasite of the pupa of this pest.

654. SILVER, G. T., and HARVEY, E. G. **Needle drop on Western Hemlock foliage.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (4).

Handling of *Tsuga heterophylla* foliage is difficult because of excessive needle drop within a short time of collecting samples. Tests show that counts of *Peronea variana* eggs can be made on branches refrigerated for as long as 2 weeks, provided that the counts are made as soon as the branches are taken from cold storage.

655. FRANCKE-GROSMANN, H. Kleinschmetterlinge als Schädlinge der Sitkafichten auf Standorten Schleswig-Holsteins. **[Small Lepidoptera as pests of Sitka Spruce on sites in Schleswig-Holstein.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/24/3, 1956. pp. 3. [G.]

Reports on injuries to terminal shoots in 8- to 15-year-old Sitka Spruce plantations by *Dioryctria abietella*, and to lateral shoots in a 15-year-old plantations by *Steganoptycha ratzeburgiana*, both observed on the island of Föhr.

656. AIZAWA, T. **[*Sarcophaga* sp. nov. (Diptera), a pupal parasite of *Dendrolimus jezoensis*.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (267–9 + 12 drawings). [Jap.]

Descriptions and illustrations of the external morphology.

657. KRUEL, W. Die Standortsbeziehungen unserer wichtigsten Kieferninsekten. **[The site relations of our most important Pine insects.]** *Arch. Forstw.* 4 (5/6), 1955 (523–32). 33 refs. [G.]

Discusses the biotic and abiotic factors (chiefly silvicultural interference) influencing the rise and distribution of epidemics of *Dendrolimus pini*, *Bupalus piniarius*, *Panolis flammea*, and *Lymantria monacha*, with a map of E. Germany for each, illustrating the development of outbreaks in 1945–55.

658. CUMING, F. G. **Distribution of the winter moth [*Operophtera brumata*, in Nova Scotia].** *Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (1). [Cf. *F.A.* 12 No. 1612.]

659. RUNGS, C. La chenille arpenteuse de l'acacia à tanin. **[*Tephrina pulinda* subsp. *deerraria* on tan Wattle.]** *Travaux Originaux, Service de la Défense des Végétaux, Direction de l'Agriculture et des Forêts, Rabat* No. 5, 1954. pp. 55. 13 refs. [F.] E.M.B.

A monograph on the taxonomy, bionomics, control etc., of the insect. Living chiefly on *Acacia gummifera* as an indigenous pest, it spread first to *A. eburnea*, extensively planted for hedges and windbreaks, and then to the plantations of *A. decurrens* var. *mollissima* covering nearly 4000 ha. in the Rharb district of N.E. Morocco, where defoliations have checked growth and caused bark scorch, necessitating in places an extension of rotation from the customary 10 years to 13 or 14. The only parasites of any importance found were the tachinid *Sturmia imberbis* and the fungus *Empusa sphaerosperma*. Dusting with BHC, SPC (a derivative of BHC), DDT or chlordane had some success in limiting local outbreaks. Aerial dusting of stands which, though severely attacked, were far from completely defoliated, did not penetrate with sufficient thoroughness. As the insects hibernate in the *A. eburnea* hedges in the vicinity and do not invade the plantations until they have defoliated the hedges, a close watch of the latter for incipient outbreaks would make preventive control possible at small cost. An appendix lists other pests which attack *A. decurrens* var. *mollissima* in Morocco.

660. KOVAČEVIĆ, Ž. Die Nahrungswahl und das Auftreten der Pflanzenschädlinge—ein Beitrag zur Kenntnis der Populationsdynamik. **[Choice of food and outbreaks of [insect] pests—a contribution to the study of population dynamics.]** *Anz. Schädlingsk.* 29 (7), 1956 (97–101). 10 refs. [G.]

Larvae from eggs of polyphagous species of various provenances, and originating in different types of forest, were reared in series, each series being fed on leaves of a different species. With *Lymantria dispar* definite modifications in life history and mortality took place with different kinds of food. Successive generations from *Quercus robur* forests could only be reared over a period of years when fed on *Q. robur* leaves. When other food was used, larval and pupal mortality occurred after 1–2 years. Also, during outbreaks of the polyhedral virus disease, lack of the preferred food was a factor making for increased mortality. The data point to the existence of races or ecotypes of *L. dispar* in which one single food plant is necessary for the maintenance of high population levels. Similar dependence on particular food species was shown by *Hyphantria cunea*. No such dependence was established for *Malacosoma neustria* or *Euproctis chrysorrhoea*.

661. KRUEL, W. Die Standortsbeziehungen des Buchenrotschwanzes (*Dasychira pudibunda*) in den baltischen Buchenvorkommen der Deutschen Demokratischen Republik. **[Site conditions affecting *D. pudibunda* outbreaks on Beech in the Baltic region of Eastern Germany.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/24/12, 1956. pp. 3. [G.]

Discusses conditions of climate, soil, aspect and stand structure characterizing the focal points of periodic outbreaks, on the basis of an epidemic lasting from 1950 to 1955.

662. KÖNIG, E. Über die Bekämpfung des Buchenrotschwanzes. **[The [chemical] control of *Dasychira pudibunda*.]** *Forstarchiv* 25 (4), 1954 (87–94). 8 refs. [G.g.]

Describes the aerial (helicopter) control of *Dasychira pudibunda*, which threatened to destroy the Beech mast in the forests of the Palatinate in 1953. About 400 ha. of 100- to 150-year Beech was sprayed with Forstviton (12% γ-BHC) at a rate of 3 kg./ha., but heavy rain within 60 hours restricted mortality to 54%. An area of 100 ha. was again sprayed using the following poisons on separate plots: Forstviton, BHC oil spray, DDT oil spray, DDT xylol, Gesarol, Multanin Ultra 90, Holfidal, Fundal, and phenothiazine. Forstviton gave a 99% kill, the DDT preparations 100%, while the stomach poisons Holfidal, phenothiazine and Fundal proved disappointing. In the plots treated with DDT many useful insects were killed as well as some other pests, and 15 birds were found dead. Beech mast in the

sprayed areas weighed 222–264 g./1000 seed *vs.* 188–192 g. in the controls; seed vitality in the former (as shown by tetrazolium and still more by germination tests) was also significantly superior. Costs of the operation are given.

663. HASEGAWA, K., and KOYAMA, R. **On the population dynamics and biotic control of *Liparis fumida* Butler.** [*Docum.*] 12*th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/8, 1956. pp. 3.

Examination of *L. fumida* larvae in a heavily infested stand of *Abies firma* showed that a large % of larvae were simultaneously infected with a virus disease and parasitized by *Apanteles liparidis* or *Entachina japonica.*

664. ANDROIĆ, M. O nekim uzrocima gradacija štetnih insekata i važnost njihova poznavanja za zaštitu suma. [**Some factors in the build-up of insect pest populations and the importance of their knowledge for forest protection.**] *Šum. List* 79 (1/2), 1955 (22–7). 8 refs. [Croat.croat.f.]

The maxima in the 'gradation' curve of *Thaumetopoea pityocampa* in Croatia between 1945 and 1953 correspond very well with the minima in the curve showing the positive and negative deviations of the Lang rain factor [annual precipitation in mm., divided by the mean annual temperature in ° C.] from its average value for Croatia. It is concluded that climatic factors, along with interrelated genetical factors, play a decisive part in determining the trend of an outbreak. It appears that pest population density depends on the number of preceding years during which the climatic conditions were favourable (low value of Lang rain factor); but no such simple and direct relationship can be established for the end of an outbreak (retrogradation), where factors other than climatic are likely to play an important part.

Coleoptera

See also Nos. 111, 285, 529, 616, 1071–2.

665. DÖHRING, E. Zur Biologie des grossen Eichenbockkäfers (*Cerambyx cerdo* L.) unter besonderer Berücksichtigung der Populationsbewegungen im Areal. [**The biology of *C. cerdo*, with particular reference to population shifts within an area.**] *Zeitschrift für angewandte Zoologie, Berlin* 42, 1955 (251–373). 10 pp. of refs. [G.g.] L.S.

A review of the distribution, taxonomy, biology, habits etc. of *C. cerdo*, and an account of field observations on numbered individuals in a strip of park in Berlin containing old Sessile and Pedunculate Oaks. Deals chiefly with climatic influences on the life cycle and ecological preferences within the habitat. The beetles preferred stems exposed to sunlight for oviposition, and rarely moved far from the tree whence they emerged. Laboratory experiments on habits, sense organs etc., indicated a stimulating influence of certain alcohols and other substances, including Oak sap, though bleeding trees were not markedly more infested in the field.

666. POTTS, S. F. **Use of sprays to control the pales weevil (*Hylobius pales*).** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 51, 1955. pp. 2.

Gives information on the formula, the mixing, quantity needed, and cost, of a lead-arsenate spray and dip to control the pales weevil.

667. FERGUSON, E. R., and THATCHER, R. C. **Preplanting dip for controlling pales weevil.** *J. For.* 54 (7), 1956 (469–70).

In small-scale tests in E. Texas, treatment of *Pinus taeda* planting stock by dipping in dilute BHC suspensions, reduced mortality due to *Hylobius pales* from 44% to 16%. Further experiment is desirable, to determine optimum concentration of BHC or possibly an alternative insecticide, but the tests reported warrant the use of a 0·2% suspension of BHC as a top dip for Pine seedlings to be planted on areas from which Pine has recently been cut. Such a dip can be applied at a few cents per 1000 seedlings and should greatly improve survival where weevil populations are high. The suspension should be constantly agitated to ensure a uniform deposition of the insecticide, and care is needed to avoid toxic effects on skin etc. of workers.

668. WARREN, G. L. **Observations on the origin of infestations of the Pine root collar weevil in plantations.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (2–3).

A recently reported infestation of Scots and Lodgepole Pine plantations in Manitoba by *Hylobius radicis* [cf. *F.A.* 17 No. 1805] has so far been unexplained, since the nearest known infestations are in central Minnesota. The hypothesis that the outbreak must have originated from an endemic population in natural stands of *Pinus banksiana* that surround the plantations, has now been confirmed by excavation of roots of 6 small Jack Pines some 16 miles from the outbreak, which contained old scars as well as live larvae.

669. WARREN, G. L. **[Soil] pH and the incidence of attack by *Hypomolyx piceus* (Deg.).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (2–3).

Some correlation between soil pH and degree of weevil infestation is more apparent than real, and the available data indicate that several related factors are involved. These include soil moisture, geographical location and climate, soil type, and host species, all of which may influence both soil pH and abundance of the insect. [Cf. *F.A.* 17 No. 3054.]

670. THOMAS, J. B., and LINDQUIST, O. H. **Notes on bark beetles and associated insects feeding in Pine shoots.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (2).

Damage to *Pinus banksiana*, *P. sylvestris*, and *P. resinosa* reproduction by barkbeetles mining in the new shoots, has occurred in a wide area of Ontario, these being identified as *Conophthorus coniperda*, *C. resinosae*, *C.* sp., *Pityophthorus cariniceps*, *P. pulicarius*, and *P.* spp. They all apparently cause the same type of damage. The weevil *Cimberis elongatus* has been found in nearly all damaged shoots along with the barkbeetles. Damage is most prevalent in small trees 1–5 in. d.b.h., growing in the open along roads, and in plantations,

fields, and cut-over areas where the reproduction is not dense. Damage is more frequent on the terminal shoots of the lateral branches than on the leaders. Some notes are given on what is at present known of the life history of the insects.

671. CROOKE, M., and KIRKLAND, R. C. **The gale of 1953: an appraisal of its influence on forest pest populations in Pine areas.** *Scot. For.* 10 (3), 1956 (135–45). 3 refs.

The rate of increase of *Myelophilus piniperda* was much greater in 1954 than in 1953. The huge populations inflicted very severe damage to standing Pine crops of all ages in NE. Scotland, but there is no evidence that this pest can be regarded as truly primary, i.e. capable of breeding in and killing normal standing Pine. A rapid infestation of roots by *Hylobius abietis* and to a lesser degree by *Hylastes ater* occurred in 1953 in root systems cross-cut from trunk, but 'whole' trees continued to resist insect attack successfully. During 1954, as the vigour of the trees ebbed, all root systems became liable to attack by these insects and populations continued to build up until 1955. It is considered that, on areas where cross-cutting of timber at stump was completed in 1953, replanting with coniferous species should be possible in 1956.

672. **[Ambrosia beetle studies.]** *Rep. B.C. For. Serv. 1955*, 1956 (81–2).

Ethylene dibromide added to a stable emulsion of lindane was effective in reducing damage after beetles had entered the wood. Adult beetles overwinter in the duff in the area containing infested logs, and a risk of attack will be influenced by proximity to the previous year's logging. Extracts of volatile substances from sapwood of susceptible logs attracted beetles in certain cage conditions, while those from non-susceptible logs failed to do so.

673. FRANCKE-GROSMANN, H. Zur Übertragung der Nährpilze bei Ambrosiakäfern. **[The conveying of nutrient fungi by ambrosia beetles.]** *Naturwissenschaften* 43 (12), 1956 (286–7). 2 refs. [G.] O.R.S.

Describes the location of the fungi on different species of beetle. A more detailed study will appear elsewhere.

674. MERKER, E. Jahrelanger Widerstand von amerikanischen Hemlockstannen gegen die Angriffe einheimischer Borkenkäfer. **[The prolonged resistance of *Tsuga heterophylla* to local [European] barkbeetles.]** *Allg. Forst- u. Jagdztg.* 125 (6), 1954 (209–17). 10 refs. [G.g.e.]

A detailed study of a primary infestation near Freiburg, leading, after strong resistance lasting 3 or 4 years, to the virtual destruction of a healthy, dense, 28-year-old stand. Though osmotic pressure generally varied between 9 and 12 atm. (as against 10–12 in sound Firs) and the bark had a high moisture content, the beetles—chiefly *Pityokteines spinidens* and *P. vorontzowi*, and to a lesser degree *P. curvidens* and *Pityophthorus micrographus*—attacked standing, healthy trees and avoided felled ones. The Hemlocks repelled repeated attacks with a copious flow of resin, preventing the formation of breeding chambers and healing the feeding wounds, but in the end they succumbed, particularly if attacked in mass by successive generations in one year. In laboratory tests, *Pityokteines spinidens* preferred the phloem sap of *T. heterophylla* to that of Fir and other conifers. Osmotic pressure did not appear to affect their choice. The resin of *T. heterophylla*, unlike that of Spruce, had no toxic, and little repellent, effect on Spruce barkbeetles, though it did materially impede them. The implications of the development of the outbreak for existing views on disposition to barkbeetle attack are discussed.

675. KNIGHT, F. B., and YASINSKI, F. M. **Incidence of trees infested by the Black Hills beetle [*Dendroctonus ponderosae*].** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 21, 1956. pp. 4.

Data were collected from infested areas in the Roosevelt National Forest, Central Colorado. They show that > 47% of currently infested trees are 1 chain or more, and 16% 5 chains or more from the nearest 'red-top' (a tree with reddish-brown foliage, that has been attacked and then abandoned). The % of newly attacked trees > 1 and > 5 chains from red-tops increased with increasing ratio of currently infested trees to red-tops and that of currently infested trees > 1 chain from previously infested trees decreased with increasing number of red-tops per acre. Regression equations for calculating the distribution of currently infested in relation to previously infested trees are given, with examples of their use.

676. WALTERS, J., and MCMULLEN, L. H. **Life history and habits of *Pseudohylesinus nebulosus* (Leconte) (Coleoptera: Scolytidae) in the interior of British Columbia.** *Canad. Ent.* 88 (5), 1956 (197–202). 6 refs. O.R.S.

Douglas Fir is the preferred host of *P. nebulosus*, although it has been collected from other conifers. The insect has a 1-year life cycle. Young adults overwinter in the bark. *From authors' summary.*

677. MCMULLEN, L. H., KING, E. W., and SHENEFELT, R. D. **The Oak bark beetle, *Pseudopityophthorus minutissimus* (Zimm.) (Coleoptera, Scolytidae) and its biology in Wisconsin.** *Canad. Ent.* 87 (11), 1955 (491–5). 2 refs. O.R.S.

The distribution in Wisconsin, life history, and habits, of this possible vector of the Oak wilt fungus.

678. BLANKWAARDT, H. F. H. De kleine bonte essenbastkever in het Amsterdamse Bos. **[*Hylesinus fraxini* in the Amsterdamse Bos.]** *Ned. Boschb.-Tijdschr.* 28 (6), 1956 (141–50). 7 refs. [Du. du.e.]

Describes the life cycle of *H. fraxini* in 1953–55. Choice of breeding material is influenced by the rainfall immediately after felling; if the weather is dry and bark of twigs has dried out, thicker material is preferred. The possibility of mass increase depends on the abundance of breeding material. After 1953, all felled trees and branches were removed; counts showed a reduction in the number of beetles in trap trees in 1954 and 1955. Such measures are only necessary where there is a heavy infestation, as

damage to living trees from the overwintering population is slight. The beetle does not appear to spread bacterial canker of Ash.

679. SZUJECKI, A. Grzyby i bakterie jako czynniki ograniczające występowanie chrabąszcza. **[Fungi and bacteria as factors limiting the spread of cockchafers.]** *Sylwan* 100*B* (4), 1956 (26–32). 11 refs. [Pol.]

Describes the sudden decrease in the late '30s, in the incidence of *Melolontha hippocastani* grubs in the Białystok forests (Poland), where in many places up to 100 grubs/sq. m. had previously been found. This decrease was correlated with infection by a number of bacteria and fungi; the following are described: *Beauveria densa* (*Botrytis tenella*), *Metarrhizium anisopliae*, *Spicaria* (*Isaria*) *farinosa*, *S.* (*I*) *fumoso-rosa*, *Bacillus septicus insectorum* (*B. tracheitis* (*graphitosis*)), and *Micrococcus nigrofaciens*.

680. SCHWERDTFEGER, F. Maikäfer- oder Engerlingsbekämpfung? **[Control of cockchafers as adults or grubs?]** *Forstarchiv* 25 (3), 1954 (49–52). 8 refs. [G.g.]

Choice of procedure depends partly on the season of the year and the number of generations of cockchafers, and in part on the area to be protected. If the nursery or regeneration area is small (up to 30 ha.), lying in a large area of broadleaved trees, it is advisable to control the grubs. If, however, the area of broadleaved trees is comparatively small, it is more practical to control the cockchafers by spraying the swarms.

681. NITTO, M., and TACHIBANA, K. **[An ecological study of May-beetles on the coastal sand dune. (II) Changes of population density of larvae in relation to lapse of time after planting. (III) White-grub damages to young plantations and the seasonal history of May-beetles.]** *Bull. Tokyo Univ. For.* No. 50, 1955 (97–115). 10 refs. [Jap.jap.e.]

The conditions of a sand-dune site are described and it is shown that the larval population of *Granida albolineata* and *Anomala albopilosa* decreases from the year of planting. The life history, habits and ecological requirements of these beetles are dealt with in Part II, which lists 16 species of Scarabaeidae coming to lamps.

Hymenoptera

See also No. 334.

682. TSAO, C. H., and HODSON, A. C. **The effect of different host species on the oviposition and survival of the introduced Pine sawfly [*Diprion similis*].** *J. econ. Ent.* 49 (3), 1956 (400–1). 6 refs.

Comparative tests with needles of *Pinus strobus* and of 4 other species of Pine showed that *P. strobus* was the first preference and gave the highest fecundity of the female and survival of feeding larvae. The data probably explain the heavier defoliation of this species in mixed stands.

683. GREEN, G. W., and DEFREITAS, A. S. **Frass-drop studies of larvae of *Neodiprion americanus banksianae* Roh. and *N. lecontei* (Fitch) (Hymenoptera: Diprionidae).** *Canad. Ent.* 87 (10), 1955 (427–40). 8 refs. O.R.S.

In both field and laboratory studies, temperature appeared to be the most important meteorological factor affecting feeding rates and consequent frass-drop. Larvae of all instars tested fed between ca. 6° and 38° C., the maximum frass-drop occurring at ca. 32°. Under field conditions, however, the presence of parasites seriously hampered studies by disrupting feeding continuity. Larvae in colonies visited by parasites drop less frass than undisturbed larvae. Larvae of *N. lecontei* drop more frass when feeding upon the current year's foliage than upon the previous year's, an increase of 32% at 35·5°. Laboratory and field results agreed well only in the earliest instar in which comparisons were made. The differences may be due to acclimatization or parasitization or both. Provided that parasites can be controlled, frass-drop measurements are useful in studying the effects of meteorological factors on feeding activity of the two species studied. They can also be used to estimate the developmental stages of populations on trees too high for visual examination. They can lead to great errors, however, if extended to estimates of population density. *From authors' summary.*

684. GRIFFITHS, K. F. **Parasitism of the eggs of *Neodiprion lecontei*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (4), 1956 (2).

Parasitization of eggs was variable throughout the 4 plots of *Pinus resinosa* examined, ranging in individual egg clusters from 0 to 87% and in different plots from 13 to 58%. At least three parasites were involved—*Tetrastichus* sp. aff. *polynemae*, *Telenomus* sp., and *Achrysocharis* sp.

685. MERKER, E., and ADLUNG, K. G. Das Auffinden der Wirtspflanze durch fliegende Fichtenblattwespen. **[The discovery of host plants by flying Spruce sawflies.]** *Naturwissenschaften* 43 (12), 1956 (286). 4 refs. [G.] O.R.S.

Observations in mixed stands showed that Spruce with already developed shoots were neglected, while those with buds breaking or about to break were visited by large numbers of insects. Laboratory experiments showed that the attraction was by scent.

686. DROOZ, A. T. **The Larch sawfly [*Pristiphora erichsonii*].** *For. Pest Leafl. U.S. For. Serv.* No. 8, 1956. pp. 4. 4 refs.

687. GRAHAM, S. A. **The Larch sawfly in the Lake States.** *For. Sci.* 2 (2), 1956 (132–60). 21 refs.

Presents biological data on *Pristiphora erichsonii*, collected during 1913–14 when conditions were very different from those of the recent outbreaks, and suggests that further work should be done on the lines followed by Morris and Miller for Spruce budworm [cf. *F.A.* 16 No. 1977].

688. HERON, R. J. **Studies on the starvation of last-instar larvae of the Larch sawfly, *Pristiphora erichsonii* (Htg.) (Hymenoptera: Tenthredinidae).** *Canad. Ent.* 87 (10), 1955 (417–27). 11 refs. O.R.S.

The studies were made on larvae subjected to experimentally induced starvation and also on partially starved larvae in field populations. Partial starvation in Larch sawfly larval populations is

symptomatic of prolonged outbreaks, and cocooned larvae in such populations are sub-normal in size and deficient in lipid reserves. Fully fed larvae from a prolonged outbreak area in eastern Manitoba were, on the average, 18% lighter than fully fed larvae from a newly established population near Pierceland, Saskatchewan. The difference in the lipid content of the two groups of larvae was negligible. Partial starvation of larvae also results in a reduction of adult reproductive capacity. *From author's summary.*

689. IVES, W. G. H. **Effect of moisture on the selection of cocooning sites by the Larch sawfly, *Pristiphora erichsonii* (Hartig).** *Canad. Ent.* 87 (7), 1955 (301–11). O.R.S.

Larvae were released uniformly over the surface of wooden trays containing a cocooning medium, (1) exposed to a moisture gradient, (2) uniformly moist, and (3) uniformly dry, and were allowed to cocoon. (3) proved unfavourable; larvae exposed to (2) cocooned near the surface and did not wander to any extent. Distribution of cocoons formed by larvae exposed to (1) showed that very dry and very wet sites were unfavourable. Moisture was a factor in determining where cocooning took place, but the favourable moisture ranges were quite wide, viz. 300–850 and 560–1000% of dry weight for non-sphagnum and sphagnum mosses respectively. *From author's summary.*

690. NAIRN, L. **Defoliation and thinning in relation to radial increment of Tamarack.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 12 (3), 1956 (2).

Work was initiated in 1951 to study the effects of various degrees of thinning of *Larix laricina* in relation to Larch sawfly infestation. Four sample plots were established in a pure stand in Alberta, three of them thinned to (*a*) 1200, (*b*) 800, and (*c*) 500 stems/acre and the fourth (*d*) left unthinned at 2000/acre. The stand had been severely defoliated by Larch sawfly for 3 consecutive years, 1949–51, but it was shown that radial increment had not declined. There were no outstanding changes in annual radial increment in (*a*), (*c*) or (*d*) during 1951–55, but on (*b*), where defoliation was heavier than elsewhere, and had probably also been heavier during the 2 years before 1951, annual radial increment was reduced by 50% compared with the previous 5 years. Remeasurement continues, and positive effects of thinning may be expected to become apparent shortly.

691. NUNBERG, M. O pojawie *Lygaeonematus wesmaeli* Tischb. i *L. laricis* Htg. (Tenthredinidae, Hym.) na modrzewiu w lasach szkolnych Szkoły Głównej Gospodarstwa Wiejskiego w Rogowie. **[Appearance of *L. wesmaeli* and *L. laricis* on Larch in the school forest of the Central School of Agriculture at Rogow.]** *Sylwan* 100*A* (3), 1956 (50–1). [Pol.russ.g.]

Notes an outbreak of these pests at Rogow (near Warsaw) in July, 1955.

692. PETERSEN, B. P. **A case of successful combination of chemical and biological control.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/24/4, 1956. pp. 3. [E.]

A plantation of Norway Spruce severely infested by the sawfly *Pristiphora abietina*, was sprayed from the air with parathion at a rate of 20 litres 1% parathion/ha. In order to obtain the minimum defoliation in the stand, it was desirable to spray as soon as the majority of eggs had hatched. Since parasitic wasps do not parasitize the sawfly larvae until these are in the last larval instar, early spraying also insures that as little harm as possible is done to the parasites. In 1955 the period of oviposition lasted only 10 days. Sawfly eggs and larvae were collected daily on new Spruce shoots of different size, and the relative frequency of eggs and larval instars was calculated, until the percentages of eggs and 5 consecutive instars were respectively 2, 14 36, 37, 10, 1, when spraying was carried out. Subsequent counts indicated a total kill of 96% of larvae, and examination of larvae found later in the summer showed an increase in parasitization compared with unsprayed controls.

693. NILSSON, E. Några observationer av *Pontania*-galler på vitpil 1955. **[Some observations on *Pontania* galls on *Salix alba* in 1955.]** *Bot. Notiser* 109 (1), 1956 (100–4). 5 refs. [Sw.] O.B.D.

Observations and statistical analyses on 10 Willows heavily infested with galls in late summer 1955 showed that 2 of the trees had significantly fewer galls than the rest. No external factors could be found to account for their relative resistance, which is presumed to be genotypic. The resistant trees proved to have significantly narrower leaves on the secondary shoots and shorter, thinner annual shoots. Further studies on the resistant trees are needed, but it is suggested that they may be hybrids between *S. alba* and *S. alba* var. *vitellina*.

Diptera

694. TURČEK, J. O značnom poškodzovaní vŕb belomorkou vŕbovou, *Helicomyia saliciperda*. **[Severe damage to Willows by *H. saliciperda*.]** *Les, Bratislava* 2 (11), 1955 (478–80). 3 refs. [Slovak.]

In Slovakia this pest attacks *Salix alba*, *S. fragilis*, *S. purpurea* and *S. babylonica*, first the thin branches, then stems up to 15 cm. diam. and thicker branches. Trees in stands and isolated stems are equally attacked.

695. BÖHM, O. Bemerkungen zur Lebensweise und Bekämpfung der Buchsbaumgallmücke, *Monarthropalpus buxi* (Lab.). **[Biology and control of *M. buxi*.]** *PflSchBer.* 17 (3/4), 1956 (44–52). 12 refs. [G.g.e.] C.G.B.

Observations on an infestation in Vienna, with the results of laboratory and field experiments in control. Both systemic insecticides and parathion proved effective. The best time for application is when the flight period is at its height, and the application should be repeated in 10–14 days. Parathion should be applied in the concentrations used for the San José scale. Gesarol is only effective against the adults and must be applied directly flight begins.

696. McALPINE, J. F. **Cone-infesting lonchaeids of the genus *Earomyia* Zett., with descriptions of five new species from western North America. (Diptera: Lonchaeidae).** *Canad. Ent.* 88 (4), 1956 (178–96). 5 refs. O.R.S.

459. Other Animals

697. **[Snails damaging *Chlorophora excelsa.*]** *Rep. For. Dep. Tanganyika 1955*, 1956 (21).

A second and serious epidemic of *Achatina fulica* occurred, and epidemics threaten to be annual. The buds of newly planted stump plants were eaten, and quite large shoots were killed by girdling in the Rondo Plateau plantations, where 21,000 snails were hand picked and destroyed. Poison bait was removed too soon by heavy rain. A fierce burn before planting is suggested for control. [Cf. *F.A.* 13 No. 508.]

46. Damage to Tree Growth by Man

See also Nos. 303, 529–30, 1168.

698. ALEXANDER, R. R. **Mortality following partial cutting in virgin Lodgepole Pine.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 16, 1954. pp. 9. 2 refs.

In 1939–40, four of twenty 5-acre plots were subjected to commercial felling of all trees > 9 in. diam., two, four, and six thousand bd. ft. were each left on four plots, and the remaining four plots were left untouched. Over 12 years, ¾ of the total loss was incurred in the first four years and ¾ of this was caused by windthrow and wind breakage. Losses tended to increase with the increase in severity of partial felling. Net volume increment on the partially felled plots was low or negative, because of the heavy losses. As reproduction was satisfactory under all treatments, commercial clear-felling and natural replacement are to be preferred to partial felling for *Pinus contorta.*

699. CROKER, T. C., JR. **Longleaf Pine seedlings damaged when seed trees are tractor-logged.** *J. For.* 54 (6), 1956 (401).

In a removal cut of Longleaf Pine seed-trees (9 seed-trees removed per acre) on the Escambia Experimental Forest in southern Alabama, tractor-logging reduced the seedling stand by 7%, and many of the surviving seedlings were damaged.

700. ROY, D. F. **Salvage logging may destroy Douglas-Fir reproduction.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 107, 1956. pp. 5. 2 refs.

In an operation in 1954 on part of the Three Creeks Burn, Humboldt county, to salvage timber killed by fire in 1951, the number of Douglas Fir seedlings established in the 1951 seed year was reduced from 1981 to 417/acre. Earlier and more careful logging could reduce seedling losses.

48. Injuries Due to Unknown or Complex Causes

701. GRAHAM, D. P. **Distribution of pole blight of Western White Pine.** *Res. Note Intermt. For. Range Exp. Sta.* No. 15, 1955. pp. 3.

Gives results of surveys in 1950–54, with tables showing the number of disease areas located each year by air or ground survey, and total and blighted acreage of pole-sized White Pine, for 6 national forests and adjacent areas.

702. DREISINGER, B. R., BAXTER, D. V., and SPURR, S. H. **Decline of Red Pine on heavy loam soils.** *Mich. For.* No. 14, 1956. pp. 2.

Pinus resinosa plantations in the Sagenaw Forest, Michigan, are showing symptoms of growth failure, similar in many respects to disorders of the same species reported in the North-east [cf. *F.A.* 11 No. 2268; 15 No. 2600]. Investigation of increment cores, root systems etc., leads to the tentative conclusion that the primary cause of decline is the soil type, an eroded loam with a highly compacted B horizon which effectively prevents the penetration of Red Pine roots. This lies ca. 16 in below the surface in the area where the damage is most severe, and ca. 21 in. below the healthier trees. Most of the Pine roots are confined to the top 12 in. of soil, a highly leached zone abnormally low in P and other mineral elements.

703. WILSON, R. W., JR. **Injury to White Pine crowns in northern New England in 1955.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 62, 1956. pp. 4. 7 refs.

During the summer of 1955 symptoms of injury were observed in terminal shoots of *Pinus strobus.* The terminal bud cluster stopped growing, while the needles, and number of needles per fascicle, were of abnormal size. A second type of injury occurred later in the season when the growing points of terminal shoots were killed. Frost ring was found in these shoots. Injury was mostly observed in trees from 3 to 8 ft. No satisfactory explanation has been found, but the damage may have been caused by frost. Height growth started early as a result of unusually high temperatures in April, and the buds were probably unduly sensitive during the normal frost period later in April.

704. MORIONDO, F. Alterazioni su piante di pioppo in seguito a crisi di attecchimento. **[A die-back of Poplars following transplantation shock.]** *Ann. Accad. ital. Sci. for.* 4, 1955 (345–86). 22 refs. [It.f.]

A detailed study, illustrated by 30 photomicrographs, of a disorder occurring in hybrid Poplars transplanted when > 4 m. high. In the following spring they developed stem cankers caused by a fungus of the Sphaeropsidales, and in the following autumn extensive top-dying above hypertrophy of the bark in the neighbourhood of epicormic shoots. This disorder is ascribed to inadequate root development due to transplantation shock. Anatomical changes in the affected parts are described in detail.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

705. SOEST, J. VAN, *et al.* **Draft recommendations on the standardization of symbols in forest mensuration.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/(50), 1956. pp. 18.

706. HUMMEL, F. C. **Proposals for the collection and publication of information on instruments used in forestry [mensuration].** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/101, 1956. pp. 4.

707. PRODAN, M. Aus der Holzmesslehre. Kritisches Sammelreferat. **[Forest mensuration. A critical review.]** *Forstarchiv* 25 (6), 1954 (129–37). 114 refs. [G.g.]

Reviews developments since 1950 [cf. *F.A.* 14 No. 1372] with references to German and other literature.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

708. GIERUSZYŃSKI, T. O zmienności cech taksacyjnych drzew w drzewostanach świerkowych górskich i niżowych. (Doniesienie tymczasowe.) **[Variability of mensurational characteristics of trees in mountain and lowland Spruce stands (Preliminary communication).]** *Sylwan* 100*A* (3), 1956 (10–3). [Pol.russ.g.]

The variability was determined of the following characteristics in two mountain and one lowland research plots (ca. 0·4 ha. each): d.b.h., mid-height diameter, total height, stem form factor and form quotient, crown length, and stem volume. In mature even-aged Spruce stands, stem volume showed the greatest variability, and taper the least (respective coefficients of variation (c.v.) being 50 and 5%). Slight differences (≯ 5%) between the c.v's for mountain and lowland stands were found for volume, d.b.h., and height. The accuracy of determining a certain dendrometric feature in Spruce stands is measured by the c.v. of this feature, not within the whole stand, but within the d.b.h. class involved. Two formulae were developed by the author for testing the accuracy of stand volume determined by the different methods. It was found that, when the c.v. is used as the criterion of accuracy, a higher degree of accuracy is obtained with methods based on the form factors of sample trees than with those based on their volume. [Cf. *F.A.* 18 No. 757.]

521. Diameter (Girth) and Sectional Area

709. MÜLLER, G. Die Messgenauigkeit mit dem Zählrohr (Messkeil) nach Dr. Müller. **[The accuracy of measurements with Müller's tree-count (prismatic diffraction) telescope.]** *Allg. Forstztg.* 65 (13/14), 1954 (166–71). [G.]

[Cf. *F.A.* 17 No. 4269.] Discusses, with formulae and tables, the quantitative effect of errors likely to occur in basal-area determination by the '*Winkelzahl*' principle, and in distance and upper diameter measurements, dealing not only with the effect of optical imperfections of the prism and the limitations of the human eye, but also with factors such as a slight shift in observation point or a failure to measure exactly at breast height (1·30 m.).

710. DÉCOURT, N. Utilisation de la photographie pour mesurer les surfaces terrières. **[The use of photography to measure basal area.]** *Rev. for. franç.* 8 (7), 1956 (505–7 + 1 photo). [F.]

Briefly describes a method of adapting Bitterlich's method [cf. *F.A.* 10 (No. 2314)] for use on photographs, the eye of the observer being replaced by a camera of focal length f and field C (C being a segment of a circle). Bitterlich's formula is replaced by

$$\frac{10{,}000}{4}\left(\frac{a'}{f}\right)^2\frac{360}{C}N$$

where N is the number of trees visible on the photograph, whose diameter on the photograph is $> a'$. The application of the method is explained. Experiments at Nancy have shown that it is practical, rapid, and simple.

522. Height, Length

See also No. 774.

711. MÄRTENS, A. Die Messlatte zum "Haga"-Höhenmesser und ihre Verwendung in der Forsteinrichtung. **[A measuring staff for use with the "Haga" hypsometer, and its uses for management purposes.]** *Forst- u. Holzw.* 11 (7; 8), 1956 (145–6; 166). 1 ref. [G.g.]

The staff, of the author's construction, replaces the base-line measuring tape commonly supplied with the Haga [cf. *F.A.* 16 No. 4118]. It is 2·3 m. long, light, and collapsible, and carries on metal runners two movable, detachable markers, of which the lower is fitted with a red flash-lamp bulb for use in a poor light. Distances can be measured to an accuracy of 0·1 m. by getting the markers to coincide in the optical range-finder, and reading direct from a scale on the staff. Another scale serves to demarcate circular sample plots of 0·05 or 0·1 ha. both on flat ground and on slopes (where they become elliptical) [cf. *F.A.* 18 No. 733]. By using a staff instead of a tape, an assistant can be dispensed with.

712. NEWNHAM, R. M. **A simple height measuring instrument (a modification of Smythies dendrometer).** *Quart. J. For.* 50 (3), 1956 (208–12).

In the modified instrument, a third scale, for distance on the ground, is introduced in place of the protractor on the original instrument, enabling the horizontal distance to be measured directly for any angle and distance of the tree.

713. ESSED, F. E. De kegelmethode voor de bepaling van de gemiddelde hoogte in eensortige bosopstanden. **[The 'cone method' of estimating**

mean height in pure stands.] *Ned. Boschb.-Tijdschr.* 27 (11), 1955 (285–7). 2 refs. [Du.e.]

The instrument used [illustrated] consists essentially of a vertically mounted, rotatable head carrying a forked piece in which is pivoted a sighting device, weighted with a plumb-bob and set at the desired angle of inclination, α. The fore-sight is adjustable for correction of this angle. The line of sight thus describes an inverted cone when the device is rotated, and the number of trees (n) whose tops are seen within the circular sweep of the sighting line, are counted. A formula is given for calculating the height of the tree of mean diameter from α, n, the number of stems/ha. and the height of eye level. Tabulated figures show the deviations between mean height obtained by this method and by the Blume-Leiss hypsometer; these range from $-2{\cdot}5$ to $+2{\cdot}4\%$ and are not systematic. The mathematical aspects will be dealt with in detail in another paper.

523. Bark

See Nos. 736, 759.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 434, 722.

714. GRAY, H. R. **The form and taper of forest-tree stems.** *Inst. Pap. imp. For. Inst. Oxf.* No. 32, 1956. pp. 79. 25 refs. Price 12*s.* 6*d.*

The terms 'form' and 'taper' are defined, for the purpose of this paper, to mean respectively, the characteristic *shape* of a solid as determined by the power index of d in the equation for the diameter/height curve of such a solid, and the *rate of narrowing* in diameter in relation to increase in height of a solid of a given form, as determined by k in the equation for the diameter/height curve of such a solid, e.g. for a paraboloid $h = k_m d^2$. The principal theories of stem form are discussed and criticized in detail, and a new theory put forward. In so far as the new theory is based on the mechanical requirements of a tree stem, consistent of course with the tree's physiological requirements, it resembles that of Metzger, but with important differences. Metzger supposes that the diameter is proportional to the stress on it, which leads to a cubical paraboloid as the form of forest-tree stems; the new theory supposes that the area of the section is proportional to the stress on it, which leads to a paraboloid. Since, for a given base and height, a cubical paraboloid contains 20% more volume, it represents a less efficient structural member than a paraboloid. Metzger's theory, moreover, does not comprehend forces other than lateral pressures acting on the crown of a tree, and so does not account for all variations of taper met with, particularly those that are found in trees with heavily branched large crowns. The new theory, taking account also of other forces, covers variations of taper that are anomalous to Metzger's theory. The new theory, which is consistent with observed fact, was formulated by *G. Odgers* [given in an appendix] and may be briefly stated thus: The mechanical stress averaged over the whole section under bark is constant along the length of the main stem and, if this is circular, the area of the section is proportional to the stress on it. Formulae are deduced to account for stem taper: (1) when horizontal wind pressures are dominant, (2) when the weight and downward thrust of the crown introduce forces additional to lateral ones. Reasons are advanced to account for the vertex of the main-stem curve corresponding, under some conditions, to a height greater than tree height. The inter-relation of crown pressures, preferential in direction, with excentric sections and the sub-normality of such sections are described, and specific examples are given. Specific examples, which accord with the theory, are also given of: (*a*) variation of the taper of different tree stems at a given time, according to conditions of growth, and (*b*) variation of the taper of a given tree with time, according to conditions of growth. The form of the stem in the top or functional crown, and at the butt is discussed and shown, on a qualitative level, to be consistent with the theory. [Some practical applications of the theory are described.] *From author's summary.*

715. BURNS, P. Y., and ADAMS, R. J. **Girard form class can be estimated from lower bole taper.** *LSU For. Notes La. agric. Exp. Sta.* No. 8, 1956. pp. 2.

Experiments at Louisiana State University show that the difficulty of determining form-class of the first 16-ft. log, which is necessary for the use of Girard form-class volume tables, can be obviated by measuring it for 50 randomly selected trees, plotting the values obtained, and also plotting on the same paper the values of lower bole (7·5 ft.) taper for the same trees. Thereafter only the latter factor need be measured and converted to Girard form class from the graph.

524.2. Volume of Single Trees

716. ARBONNIER, P. Mesure optique du volume bois fort tige des feuillus sur pied. **[Ocular measurement of stem volume [down to 7 cm. diam.] of standing broadleaved trees.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/102, 1956. pp. 9. [F.]

Describes a method, using a theodolite, of estimating the volume of a standing broadleaved tree (when leafless), by measuring diameter and length of successive logs, and calculating total volume from the sum of volumes so obtained. The method is somewhat time-consuming and is vitiated by wind, but it avoids climbing and is suitable for sample-plot work, and for trees with forked or much ramified stems.

524.3. Volume of Tree Groups and Stands

See also Nos. 735–8, 772.

717. OSANAI, T. **[On the Todo-Fir [*Abies mayriana*] volume tables based on height curves.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (77–82). [Jap.e.*e.*]

A general volume table is developed from several height curves based on 6700 stems from all parts of Hokkaido. Supporting regressions are given.

718. PRIELIPP, D. O. **Balsam Fir tree volume in the Lake States.** *For. Sci.* 2 (2), 1956 (92–9). 2 refs.

Drawn widely from the Upper Peninsula of Michigan, 476 stems were measured in 100-in. lengths, separately for swamp, transition, and upland sites, and the differences in volume examined by the combined-variable method, using (d.b.h. × height)^2 as a function of volume. The adequacy of this method (rapid and available for smaller samples) compared with the slightly more accurate and much more tedious harmonized curve method [cf. Spurr, *F.A.* 14 No. 525 for both], is illustrated statistically. Tables for total bole volume u.b. and for merchantable volume u.b. to a 3-in. top o.b. are given, combined for all sites, for 4–8 in. d.b.h. and separately for dry and wet sites for 9–14 in., the height ranging from 10 to 70 ft.

719. FUNKING, D. L., and YOUNG, H. E. **Balsam Fir volume tables, Central Maine.** *Tech. Note Univ. Me. For. Dep.* No. 42, 1955. pp. 7.

720. ANDERSEN, H. E. **Cubic foot volume tables for Spruce and Hemlock pole-timber.** *Tech. Note Alaska For. Res. Cent.* No. 29, 1956. pp. 1. 1 ref.

The new volume table (which serves for both species) gives gross cu.-ft. volume of barked wood from a 1-ft. stump to a 4-in. top and is based on 127 trees ranging from 5 to 10·9 in. d.b.h., from both old and immature stands.

721. Verslag over de inhoudstabellen voor de groveden. **[Volume tables for Scots Pine.]** *Ned. Boschb.-Tijdschr.* 27 (11), 1955 (288, 290–2 + 4 tbls.). [Du.e.]

Presents and comments on volume tables prepared by the Bosbouwproefstation T.N.O. and the Institut voor Bosbouwkundig Onderzoek, Wageningen, from measurements on 1116 trees in 42 stands, using Näslund's form-factor equation

$$f = p + q\frac{1}{h} + r\frac{h}{d}$$

[cf. *F.A.* 5 p. 66]. The table is recommended without modification for management and census purposes, but for sales of standing timber it should be checked from measurements on 20–25 randomly chosen sample trees, and a suitable correction factor applied.

722. HAUSSER, K.; BOLSINGER, E. Inhalt und Schaftform der grünen Douglasie (*Pseudotsuga taxifolia* Britt. var. *viridis*). I. Eine Derbholzmassentafel für die grüne Douglasie. II. Ausbauchungsreihen, Rindenstärke und Sortierungstafel der grünen Douglasie. **[Volume and stem form of *P. taxifolia* var. *viridis*. I. Timber volume table. II. Diameter-quotient series, bark thickness, and assortment tables.]** *Mitt. württemb. forstl. VersAnst.* 13 (2), 1956. pp. 55. 15 refs. [G.]

(I) The volume table based on ca. 4960 stems chiefly from Württemberg, gives o.b. volumes of timber > 7 cm. in diameter. Comparisons are made of these, and of artificial timber form factors, with figures for Douglas in America, Britain and the Netherlands, and for other conifers in Germany. (II) Gives (*a*) tables, based on ca. 4360 stems from Württemberg, of artificial and true, o.b. and u.b., diameter-quotient series, and comparisons with data for other conifers in Germany; (*b*) tables of bark thickness and bark %, based on 271 stems, and a comparison with other German conifers; and (*c*) an assortment table compiled from the data gained in (*a*) and (*b*).

524.4. Recording of Data. Organization of Measuring Parties and their Work

723. SPURR, S. H. **Cumulative basal area tally sheet.** *Mich. For.* No. 17, 1956. pp. 2.

The principle of the cumulative tally sheet can readily be adapted to basal areas, so that the forester in the field may keep track both of total b.a. and number of trees as he enumerates timber or marks it for cutting. A form used at the University of Michigan furnishes an example.

724. REID, E. S. **The helicopter and the forester.** *Pulp Paper Mag. Can.* 57 (8), 1956 (149 . . . 158).

Details are given of the staff, organization, performance and some costs, in the sample enumeration of 2,000,000 acres of inaccessible forest in British Columbia, using a chartered helicopter to move men and supplies. Eight enumeration teams of 2–3 men and 3 mensuration teams of 4 men, with this assistance, covered the area in 4½ months instead of 4 seasons.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 711, 799.

725. CARRON, L. T. **Note on the terminology of 'inventory'.** *Aust. For.* 20 (1), 1956 (26–9). 6 refs.

Discusses and distinguishes the operations commonly included under the term 'survey', and recommends definitions of 'survey', 'reconnaissance', 'inventory', 'assessment', 'enumeration' etc.; also deals with the terminology of sampling.

726. LOOMIS, R. D. **Forest surveys in Alberta.** *For. Chron.* 32 (2), 1956 (172–7).

A revision of the need, method, and application of a provincial forest inventory to conditions in Alberta.

727. SCHUMACHER, F. X., and CHAPMAN, R. A. **Sampling methods in forestry and range management.** *Bull. Duke Univ. Sch. For.* No. 7 (3rd. ed. rev.) 1954. pp. 222. 10 refs. Price $4·50.

A revision of the book first published in 1942 [cf. *F.A.* 4 p. 256]. Additional sections are given on representative sampling, cluster sampling, and proportional sampling of strata.

728. DAGNELIE, P. L'échantillonnage statistique appliqué à la prospection et aux inventaires forestiers. **[Sampling by statistical methods applied to forest surveys and timber cruises.]** *Ann. Gembl.* 62 (2), 1956 (109–34). 34 refs. [F.] A.P.B.

Describes different methods used in sampling, discusses their relative value, and cites some examples of their use in both tropical and temperate regions.

729. Pardé, J. Inventaires forestiers et méthode statistique. **[Forest inventories and statistical method.]** *Rev. for. franç.* 8 (8/9), 1956 (598–614). 20 refs. [F.]

Reviews recent research on sampling methods and their application in Western Europe, and discusses their applicability to French conditions.

730. Richter, A. Fragen der Holzvorrats- und Zuwachsinventur im Walde. **[Growing stock and increment enumeration.]** *Arch. Forstw.* 4 (5/6), 1955 (467–80). [G.]

Outlines the present accepted method of statistically based variable circular-plot sampling for growing-stock enumerations and discusses plot size and grid mesh [cf. *F.A.* 16 No. 3257]. Data are given for sampling, at 2 plots/ha., a wooded area of 21,000 ha., carrying mixed species, at fiduciary levels $\geq$ 5% and 1% for 28 ranges and 4 *Oberförsterei* respectively. The investigations to be undertaken for determining volume increment % are also outlined. Work will be based on the sample enumeration plots, where increment borings will be made in trees to be measured and described in detail. For both growing-stock and increment volumes, Kräut's volume tariff, divided separately for conifers and hardwoods into 14 five-cm. diameter classes will be the basis. The cost of growing-stock enumerations, including calculation and tabulation, is put at DM.2·50/wooded ha., that of increment at DM.0·15–0·20.

731. Hasenkamp, J. G. Die Genauigkeit der systematischen Stichprobennahme bei forstlichen Vorratsinventuren. **[The accuracy of systematic sampling in forest inventories.]** *Mitt. Bundesforsch-Anst. Forst- u. Holzw.* No. 35, 1954. pp. [10] + 62 + 44 tbls. 82 refs. [G.g.]

The basis of this investigation is a 6% systematic sample enumeration in 1680 circular 6-are plots on a private estate in Westphalia, comprising ca. 1700 ha. of forest of all age classes. The 100·8 ha. so enumerated were treated as if they formed a continuous, fully enumerated forest. The data were grouped into 13 broad categories according to age and composition and subjected to a number of sampling tests in numerous replications, varying the number, the size, and the spatial distribution of sample units and applying various degrees of stratification. Data from a fully enumerated uneven-aged Douglas Fir stand in Oregon [cf. *F.A.* 13 No. 3214] were treated in a similar manner, substituting 'block' formation for the (inapplicable) stratification. Investigations were also made of the homogeneity of the populations. From the statistical evaluation of these figures the following main conclusions are drawn: (1) In populations of approximately normal distribution, the formulae for random sampling are applicable to even-spaced systematic sampling, and the results for widely different sampling intensities are clearly amenable to the statistical laws; but if the distribution deviates considerably from normal, discrepancies in the results increase as sampling intensity decreases. (2) The spatial distribution of sample units affects the degree of accuracy. Only even-spaced systematic sampling is satisfactory, though small deviations from regular spacing in ca. 10–15% of the sample units are acceptable. Unevenly spaced systematic sampling demands a high degree of homogeneity in the population. (3) The error can be reduced by stratification, including division into arbitrary 'blocks'. (4) Generally, basal area showed less variability than volume. (5) Where the populations—or sub-populations—were homogeneous, accuracy of results could be computed satisfactorily from as few as 6 or even 4 sample units. (6) For efficient enumeration a suitable pilot method to determine the coefficient of variation of the component strata is desirable. (7) The methods used to determine error compare favourably with others, e.g. those of Schumacher and Chapman or Yates.

732. Mesavage, C., and Grosenbaugh, L. R. **Efficiency of several cruising designs on small tracts in North Arkansas.** *J. For.* 54 (9), 1956 (569–76).

Square, rectangular, and random arrangement of 160 $\frac{1}{10}$-acre sample plots were compared for accuracy and efficiency of volume estimates on 12 tracts of 25·6 acres each. The square arrangement was most efficient for 5 of the 12 tracts, the rectangular for 4, the random arrangement for 3. A comparison was also made of sampling error and efficiency on $\frac{1}{10}$-, $\frac{1}{8}$-, $\frac{2}{8}$-, and $\frac{4}{8}$-acre plots in 20% cruises of eight 40-acre compartments. In sawtimber stands the increased accuracy of the $\frac{1}{10}$-acre plots more than offset the higher costs of this method, but for cruises of sparse scattered timber $\frac{4}{8}$-acre plots were more efficient and still larger plots might have been even more so. Of 3 designs for estimating bd. ft. volume/acre, the most efficient, on a 360-acre tract, was a 6·25% cruise using 225 $\frac{1}{10}$-acre plots in a 4 × 4 chain square grid arrangement, preferable to both a random selection of the same number of $\frac{1}{10}$-acre plots, and a 10% cruise using 180 $\frac{1}{4}$-acre plots in a 2 × 10 chain rectangular grid. *From authors' summary.*

733. Baumann, H. Rationelle Stichprobenverfahren in der Forsteinrichtung. **[Efficient sampling methods in forest management.]** *Allg. Forst- u. Jagdztg.* 126 (1), 1955 (11–22). 21 refs. [G.g.e.]

After a discussion of general sampling problems such as intensity, and distribution, size and shape of plots, the author discusses the relative merits of Bitterlich's '*Winkelzahl*' method and the enumeration of circular sample plots of 0·1 ha. To find the boundary of the latter he describes a method of sighting from near the periphery with the optical range-finder of a hypsometer of the Blume-Leiss type [cf. *F.A.* 16 No. 3247]. This is sighted on to a measuring staff placed in the centre, whose markers have been set at the required distance, and the observer moves slightly backwards and forwards until the two markers coincide in the sight of the instrument [cf. *F.A.* 13 No. 526]. To obtain the same distance R on a slope whose mean deviation from the horizontal is $\alpha°$, the distance of the markers

on the staff $b°$ has to be increased to

$$\frac{b°}{\cos \alpha.}$$

By sighting on the markers in this position from a point level with the staff, the distance measured would be increased to

$$\frac{R}{\cos \alpha}$$

(and correspondingly less for intermediate points). If the ellipse so delimited is projected on to a horizontal plane, another ellipse is obtained, whose half-axes are

$$\frac{R}{\cos \alpha}$$

and $R \cos \alpha$ respectively i.e. an ellipse whose area equals that of the original circular sample plot of radius R. If the measuring staff is fitted with a suitable scale, adjustment for slope becomes a simple operation. Various reference tables are appended. [Cf. *F.A.* 18 No. 711.]

734. BRYAN, M. B. **A simplified method of correcting for slope on circular sample plots.** *J. For.* 54 (7), 1956 (442–5).

The projection of a horizontal circular plot on to a slope is an ellipse, the determination of the boundaries of which is unnecessarily complicated, particularly where concentric sample plots of various areas are required. The simplification here described maintains the circle on the slope and gives formulae, tables and the method of marking the tapes for appropriately increasing the radii for different slopes and areas of plots (0·01–1·0 acre).

525. Volume by Assortments. Merchantable Volume

See also No. 722.

735. MATSUI, Z., and BABA, K. **[The log classification by 10-cm. unit diameter or commercial unit and logging utilization of Todo-fir [*Abies mayriana*] stem.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 5, 1956 (64–76). 4 refs. [Jap.e.]

Develops a table, based on measurement of 4515 stems, showing the utilization % of 3·7-m. logs from boles of mean d.b.h. of 30, 40 and 50 cm. u.b., and bole heights of 14, 16, 18 . . . 32 m. Supporting data include bark thickness and stumpwood tables.

736. DAVIS, D.; PUDDEN, H. H. C. **[Tree volume in *Cupressus lusitanica*.]** *Tech. Note For. Dep. Kenya* No. 12, 1953, pp. 10; No. 35, 1956, pp. 4; No. 39, 1956, pp. 1.

Volume tables are variously presented for timber to 8-in. top, 6-in. top, and smallwood 2- to 8-in. diam., for trees aged 7–40 years and d.b.h. 5–20 in., with data on bark thickness.

737. BANKS, W. G., and HAMPF, F. E. **Estimating upper-stem and limb-wood volume in northeastern hardwoods.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 50, 1955. pp. 2.

Data from 314 trees of sawlog size showed a mean volume of 121 cu. ft. of branchwood per 1000 cu. ft. of growing stock, and 0·49 cords of upper stem (down to 4 in. diam.) per 1000 bd. ft. of sawlog timber.

738. DUFF, G. **Estimation of volume of forked trees in exotic coniferous stands in New Zealand.** *N.Z. For. Res. Notes* No. 6, 1956. pp. 10. 1 ref.

A method is described and a table presented for estimating the volume of forked trees for all New-Zealand-grown exotic conifers [*Pinus radiata, P. nigra* var. *calabrica, P. elliottii, P. taeda, P. strobus, P. contorta* and *Pseudotsuga taxifolia*] from the volume of normal trees of the same species and dimensions and the mean stand height. The table shows forked-tree volumes as %'s of normal-tree volumes for total stem volume and merchantable-stem volume to 4- and 6-in. tops inside bark for 10-ft. mean stand-height classes from 20 to 150 ft. The %'s are the same for all species. The only extra field work to that required for normal trees, is the separate recording of forked trees by d.b.h. The preparation, accuracy, and use of the table are described and discussed, as well as other methods tried and considered less efficient. [Cf. *F.A.* 13 No. 1426.] *From author's summary.*

739. GOEBEL, N. B. **Board-foot—bolt-foot volume ratios for White Oak [*Q. alba*] logs.** *J. For.* 54 (7), 1956 (452–4).

For tight cooperage, bolts for head and stave stock are cut to 23 and 39 in. respectively. These are split into 4 sectors and the chord measured on the upper end face to give bolt-foot volume, i.e. chord length in inches divided by 12; e.g. with a chord of 15 in. the bolt-foot volume is 1·25 bolt feet. The relation between this and the volume by Doyle rule in bd. ft. is given for 6, 8, 10 and 12 ft. logs of 14–26 in. diam. for head and stave stock, with detailed statistical support.

740. KULKARNI, D. H. **Heartwood volumes and *katha* yields by indigenous method from dry type Khair [*Acacia catechu*] of Central India.** *Indian For.* 82 (8), 1956 (403–5).

Extraction of *katha* from heartwood of *A. catechu* is an important local industry in Central India. The small size of the trees renders existing volume tables useless. The author presents a table, based on ca. 350 trees, showing basal and breast-high growth, length of utilizable bole, total solid volume, heartwood volume, heartwood % and yield of *katha* per tree.

526. Log Measurement. Scaling

741. Barême de cubage. **[Log volume table.]** Centre technique forestier tropical, Nogent-sur-Marne. 1956. pp. 77. [F.]

A log scale for tropical timbers for lengths 1–10 m. and diameters 0·3–1·99 m. by 1-cm. classes.

742. ANDERSEN, H. E., and WEISGERBER, J. E. **Use of long-log scaling tables in southeast Alaska.** *Tech. Note Alaska For. Res. Cent.* No. 32, 1956. pp. 2. 1 ref.

A long-log board-foot table was made for logs over 42 ft. long, using the Scribner Decimal C rule and allowing an average taper for Western Hemlock and Sitka Spruce logs of 1 in./6 ft. log length.

Measurements on log samples showed that variation of taper in individual logs was high but that variations about the mean of a large number of logs are low. Comparison of results from the table and from caliper scaling on 17 rafts, each containing from 53 to 687 pieces, showed that the table gave sufficiently accurate results. It should not, however, be used for Western Red Cedar, which has a greater taper.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also No. 789.

743. SARVAS, R. Ein Verfahren zum Zeichnen der Kronenkarten. [**A method of plotting crown projections.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/23/8, 1956. pp. 4 + 2 dgms. 6 refs. [G.f.e.]

Describes a method of drawing crown projections, in which the map is built up, not from the plotting of each individual crown, but from the intersection of crown circumferences with a 20 m. strip grid, using Cajanus' cylinder [cf. *F.A.* 16 No. 4395].

744. RODIONOV, M. S. K metodike opredelenija količestva listvy v molodyh polezaščitnyh lesnyh nasaždenijah. [**Methods of determining the amount of foliage in young shelterbelt stands.**] *Bot. Ž.* 41 (4), 1956 (532–4). 8 refs. [Russ.]

In pure, 1- to 7-year-old shelterbelt plantations at the Bogdin experimental station, Astrakhan region, the fresh leaves taken in late August from 48 trees of *Ulmus parvifolia* and 60 of *Populus* '*canadensis*' were weighed > 3 min. after removal. Petiole weight, determined by sampling, was deducted from the figures obtained. Two diameters at right angles were measured for each tree at the root collar (above any root spurs). Correlation coefficients for diameter (d) and fresh leaf weight (f) were 0·97 ± 0·007–0·008 for both species, and tests of regression equations giving f from d were satisfactory in most cases.

745. JOKELA, E., and YLÄNEN, J. Koivikoiden lehtisadon määrästä. [**Amount of foliage in Birch stands.**] *Metsät. Aikak.* 1956 (4), (131–2). 9 refs. [Fi.e.]

Foliage seems to increase evenly until the growing stock reaches middle age and then to decrease slowly. One reason for the decrease is the decreasing number of trees per unit area. A comparison of d.b.h. and the area of evaporating foliage shows that Birch needs a large crown to reach a large d.b.h. On average the foliage in Birch stands seems enough to cover the site 2–3 times at leaf fall. *From author's summary.*

746. MIROSLAVOV, E. A. Ob opredelenii isparjajuščeĭ poverhnosti berezy v zimniĭ period. [**Determination of the evaporating surface of *Betula verrucosa* in winter.**] *Bot. Ž.* 41 (4), 1956 (534–7). 11 refs. [Russ.]

In an attempt to estimate the surface area of twigs on an open-grown tree 70–80 years old, an 'average' branch at mid-crown was removed; on this the numbers of 1-, 2- and 3-year twigs were counted and 100 of each group measured for calculation of their surface area, dead twigs being left out of account. Results are tabulated and used with estimates of total twig numbers in these groups to show a surface area of ca. 25 sq. m., which, with an estimate based on some measurements of the older branches, gives a total surface area of ca. 85 sq. m., excluding the bole. Buds were also counted on 1-, 2- and 3-year twigs (100 of each group) and estimates are presented of their numbers for the whole tree. Some determinations were made incidentally of the bark weight and its chlorophyll content for 100 twigs each of the same age groups and for 20 each of 7 groups of older branches. In the 1-year twigs the chlorophyll content was too low for determination: in 2- to 3-year twigs it was ca. 0·02%, and in older branches 0·3% of the dry bark weight.

54. Assessment of Site Quality

See also Nos. 30, 244, 250, 755–6, 759–60.

747. JAMESON, J. S. **An investigation into the productivity of three physiographic sites in the Cochrane District of Ontario.** *Abstr. of thesis*, in *For. Chron.* 32 (2), 1956 (256).

The object of the study was to determine the variation in height and diameter growth and yield at maturity of *Picea mariana*, pure and in mixture, growing on three 'physiographic' sites, in order to test Hills' system of site classification [cf. *F.A.* 12 No. 832]. The variation in height growth was found to be highly significant, that in diameter growth negligible.

748. **Preliminary forest site productivity rating guide.** *For. Mimeo N.H. agric. Exp. Sta.* No. 5, 1956. pp. 7.

Gives a tentative site classification, based on soil types for New Hampshire.

749. KREIS, E. A., JR., BENNETT, F. A., and PATTERSON, A. E. **A site-prediction test in Slash Pine plantations in the middle coastal plain of Georgia.** *Res. Note Stheast. For. Exp. Sta.* No. 93, 1956. pp. 2. 2 refs.

In a pilot study to test the application of the Barnes and Ralston method of assessing site quality [cf. *F.A.* 16 No. 4397; 17 No. 1853] for Georgia, it was found that 'depth to mottling' was closely correlated with height of dominant trees at 25 years except where this depth was < 10 in. Diameters in Georgia were 5–8% larger than for the same site class, age and number of trees/acre in Florida.

750. MOGREN, E. W. **A site index classification for Ponderosa Pine in Northern Colorado.** *Res. Note Colo. Sch. For. Range Mgmt.* No. 5, 1956. pp. 2. 1 ref.

A downward extension of Meyer's generally applicable classification for the poor Pine sites on the E. slope of the Front Range, based on 84 sample plots.

751. MEYER, D. **The relation of soil horizon texture and acidity to the site index of Aspen in Northern Minnesota.** *Minn. For. Note* No. 52, 1956. pp. 2. 1 ref.

A study involving 36 sample plots on sites varying greatly in drainage, topography, and climate,

showed highly significant correlations between site index and the silt and clay content of B and C horizons, and between site index and pH of the C horizon, the latter being correlated with its silt and clay content.

55. Age Determination

752. OSMASTON, H. A. **Determination of age/girth and similar relationships in tropical forestry.** *Emp. For. Rev.* 35 (2), 1956 (193–7). 6 refs.

[Cf. *F.A.* 13 No. 4103.] Published methods of estimating the relationship of girth to age in uneven-aged tropical forests of trees with indistinct growth rings are not very precise, and involve some dubious graphical construction. By the use of simple arithmetic it is, however, possible to avoid some of these errors, and two examples have been worked out by this method, using the data of previous authors; the results obtained by each method are compared, and applications to age/height and age/volume relationships are indicated. *Author's summary.*

56. Increment. Development and Structure of Stands

See also Nos. 161–2, 172–4, 177, 180, 230–2, 282, 312 *et seq.*, 388–9, 418 *et seq.*, 690, 1202.

753. ILVESSALO, Y. [Editor] **Determination of increment: collection of papers dealing with the problem.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/24–47, 1956. pp. 140.

Comprises the following papers (language indicated in square brackets): Introduction [E.] (*Y. Ilvessalo*); Summary of growth and yield studies in Canada. [E.] (*J. D. B. Harrison*); Methods of determining increment in Czechoslovakia. [G.] (*J. Řehák*); Rapid methods of increment determination. [G.] (*H. A. Henriksen*); On the methods for determination of increment generally used in Finland. [E.] (*Y. Ilvessalo*); Rapid determination of increment. [F.] (*L. Schaeffer*); Possibilities of determining increment. [G.] (*M. Prodan*); How can the basal-area increment on permanent sample plots be more accurately determined? [G.] (*E. Assmann*); Rapid determination of yield and increment in single uniform stands of the temperate and cool zones. [G.] (*J. Weck*); The criteria for crown quality classes in inventories of yield and increment. [G.] (*F. Loetsch*); Methods of increment study on the basis of site characteristics. [G.] (*W. Erteld*); Considerations on the computation of diameter growth by diameter classes. [E.] (*J. H. A. Ferguson*); Rapid determination of growth [E.] (*E. Ohtomo*); Rapid determination of increment in the Netherlands. [G.] (*J. van Soest*); Rapid determination of increment in New Zealand. [E.] (*G. Duff*); Measurements and calculations for the determination of increment in Norway. [Nor.] (*A. Brantseg*); Methods used in the Philippines. [E.] (*F. O. Chinte*); Methods of determining increment in Poland. [G.] (*B. Sikora*); Methods of increment determination employed at the Swedish Forest Research Institute. [G.] (*B. Eklund*); Determination of increment in Switzerland. [G.] (*H. Etter*); Rapid determination of increment in Great Britain. [E.] (*F. C. Hummel*); On the methods of determination of stand growth in U.S.A. [E.] (*A. Nyssönen*); Methods of determining increment in Jugoslavia [G.] (*V. Matić*).

754. ILVESSALO, Y. **Purposes and methods of forest yield investigation.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/21, 1956. pp. 6. 2 refs. [E.]

With particular reference to Finnish research.

755. RAY, R. G. **Site-types, growth and yield at the Lake Edward Forest Experimental area, Quebec.** *Tech. Note For. Br. Can.* No. 27, 1956. pp. 53. 8 refs.

Detailed report on a study begun in 1924, with an appendix on the indicator value of vegetation. The data are set out in 22 tables, and 14 graphs and nomograms.

756. PERKAL, J., and BATTEK, J. Próba oceny rozwoju drzewostanów. **[An attempt at estimating the development of stands.]** *Sylwan* 99 (1), 1955 (12–31). 3 refs. [Pol.]

Since the mean d.b.h. and mean height (h.) of a stand are correlated, the authors suggest choosing as characteristic features of a stand another pair of magnitudes: 'site class' (s.c.), which is regarded as a feature of the stand, and 'slenderness' (sl.) i.e. the height/d.b.h. ratio. The range of each of these two totally unrelated magnitudes is expressed by numbers between + 100 and — 100. Thus s.c.0 refers to sites of mean site class, s.c. + 83 means that 83% of sites with positive s.c. have a lower s.c. than the site examined. The s.c. and sl. of a stand of a given (mean) age, can be read from an orthogonal scale (based on Gaussian frequencies and giving the s.c. and sl. values for 20-year age classes from 10 to 109 years) which is superimposed on a d.b.h./h. growth-curve having age points marked on it. The basis, development, and application of the scales is explained in detail. It is claimed that h. and d.b.h. data in yield tables (Tjurin, Jedliński, Płoński, Schwappach) referring to *different* site classes can be represented by a single growth-curve (only the age points moving along the curve when one passes from one s.c. to another). Thus the growth-curve referred to above can be obtained from the existing yield tables. As, however, neither the variance nor the covariance of d.b.h. and h can be obtained in this way, the authors made their own measurements (on 32 groups of 40 Spruce trees each) and, using this admittedly insufficient population, developed tentative nomograms for determining s.c. and sl. of stands (and single stems). It is claimed that this method makes it possible to compare stands of differing botanical composition; it may also be used for comparing the s.c. and sl. of a stand in different development phases, and before and after silvicultural treatment. The nomogram suggested can be used only for the areas from which the initial data were obtained.

757. GIERUSZYŃSKI, T. Struktura i zmienność przyrostów drzew w drzewostanach świerkowych w różnych srodowiskach ekologicznych. (Doniesienie

tymczasowe). **[Structure and variability of tree increments in Spruce stands growing in different ecological surroundings. (Preliminary communication).]** *Sylwan* 100*A* (3), 1956 (14–8). [Pol.russ.g.]

Measurements in the same research plots as in the preceding paper [see *F.A.* 18 No. 708] (age ca. 80 years) gave the following results: (1) Increment figures for stem d.b.h., height, form factor and volume, and the volume increment %, show unequal variability in mature even-aged Spruce stands, the coefficients of variation (c.v.) being, as a rule, greater for the whole stand than for individual d.b.h. classes, the c.v.'s are: for height increment, 35 (25); stem volume increment %, 40 (25); d.b.h. increment, 60 (35); volume increment, 70 (30); and form factor increment, 625% (585%); the first figure referring to the whole stand, the second to a single diameter class. (2) Slightly greater c.v.'s were found for lowland than for mountain stands. (3) The accuracy of the volume-increment determination for a stand is measured by the c.v. within d.b.h. classes, not within the whole stand. Several formulae are developed for determining the % error in determining stand volume increment by means of sample trees.

758. LUND, R. D. **The growth of conifers and observations on thinning.** *Scot. For.* 10 (3), 1956 (151–4).

Gives some account of basal-area increment over a period of 28 years on plantations in S. central Scotland, and some conclusions drawn from them on thinning. It is shown that Japanese and hybrid Larches are doing less well at about 50 years than European Larch (average b.a. increment per annum 6·31 and 7·03% compared with 7·70%).

759. KLEPAC, D. L'accroissement du sapin dans les différentes associations de la Croatie occidentale. **[The increment of *Abies alba* in different associations of western Croatia.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/22, 1956. pp. 6 + 3 gphs. [F.f.]

A study was made of comparative rates of increment of Silver Fir growing in 3 different associations: (*a*) *Abieto-Blechnetum* on siliceous soil, (*b*) *Fagetum-Abietetosum* and (*c*) *Calamagrosteto-Abietum*, both on calcareous soil. Annual diameter increment in (*a*) as a function of diameter produced a parabolic curve, with maximum increment in trees of 65–75 cm. diam.; in (*b*) and (*c*) the curve was more hyperbolic. Maximum annual volume increment in (*a*) usually occurred in trees > 75 cm. diam., but volume increment in (*b*) and (*c*) was directly correlated with diameter up to at least a diameter of 100 cm. In all associations there was a direct correlation between diam. and bark thickness; bark thickness was least in (*a*) and greatest in (*c*).

760. BENNETT, F. A. **Growth of Slash Pine plantations on the George Walton Experimental Forest.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 66, 1956. pp. 20 + 1 tbl.

Reports on the growth and yield of 21 plantations in Georgia. Diameter growth varied directly with spacing, resulting in earlier sawtimber in widely spaced stands (but also more forking). Survival rates and yield were both closely correlated with site index for naturally grown Slash Pine.

761. SPURR, S. H., and ALLISON, J. H. **The growth of mature Red Pine in Minnesota.** *J. For.* 54 (7), 1956 (446–51). 8 refs.

A further analysis of mixed, fire-derived, 99- to 142-year stands of *Pinus resinosa* [cf. *F.A.* 14 No. 1425] shows substantially greater net growth than the tables for untended mixed stands predict. The unexpectedly high net increment of Red Pine in these stands is partly due to natural thinning caused by mortality of the relatively short-lived Jack Pine. The longevity of the various species and the successional trends from burn to Spruce/Fir climax are examined and conclusions drawn for the silviculture of Red Pine.

762. RUDOLPH, V. J., and ROBBINS, P. W. **Growth of planted Black Walnut on the Michigan State University campus.** *Quart. Bull. Mich. agric. Exp. Sta.* 38 (4), 1956 (520–3).

Gives data on stand volume, increment etc. for an acre of *Juglans nigra* planted in 1910.

763. MURRAY, F. **Growth of Oak and Hickory on sand in the Stinchfield Woods.** *Mich. For.* No. 15, 1956. pp. 2.

Gives the first 5-year data for growth of Black, Red, and White Oak and Hickory in poor mixed stands of coppice origin.

764. JOHNSTON, D. R. **An enumeration of the mature Oak in the Forest of Bere.** *Forestry* 29 (2), 1956 (154–68). 4 refs.

Describes the methods used in the field and in the office to determine the standing volumes and increments of 100- and 130-year-old Oak in the Forest of Bere, Hampshire, during working-plan revision. The figures obtained show that the standing volumes and increments of *Quercus sessiliflora* are considerably higher than those of *Q. robur* on the three sites investigated, viz. clays, sands, and gravels, while for both species sands appear to be the most favourable and gravels the least favourable soil types. There was little difference in the mean values for increment and standing volume between the 100- and the 130-year-old *Q. robur*. *From author's summary.*

765. PLAVŠIĆ, M. Die schmalblättrige Esche (*Fraxinus angustifolia* Vahl) und ihr Stärkenzuwachs. **[*F. angustifolia* and its diameter increment.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/23, 1956. pp. 8. 6 refs. [G.]

A study of the species in Jugoslavia.

766. STAPLETON, C. C. **The cultivation of indigenous trees and shrubs.** *J. S. Afr. For. Ass.* No. 26, 1955 (10–7).

Includes figures for rates of growth under natural conditions of *Podocarpus* spp. (18 in. diam. in 160–230 years); *Ocotea bullata* (20 in., 220 years); *Apodytes dimidiata* (14 in., 160 years); *Olea laurifolia* 16 in., 200 years); and notes on ornamentals.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also No. 775.

767. Hombert, J. Étude comparative de diverses méthodes de calcul de l'accroissement moyen annuel: proposition d'une nouvelle méthode. [**A comparative study of different methods of calculating mean annual increment: proposal for a new method.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/23/12, 1956. pp. 47 + 4 gphs. 7 refs. [F.]

Discusses in detail a number of methods of calculating m.a.i. in g.b.h., and proposes a new method, using real rather than theoretical mean values for each girth class, and determining stationary trees and trees moving from one class to another by Prodan's method. Examples of all the methods discussed are worked out on the basis of data from two complete inventories made at an interval of 5 years at Mayumbe, Belgian Congo.

768. Klepac, D. Utvrđivanje prirasta po metodi izvrtaka. (Prethodna istraživanja o prirašćivanju hrasta kitnjaka.) [**Determination of increment by the increment borer method. (Preliminary investigations on the increment of *Quercus sessiliflora*).**] *Šum. List* 79 (11/12), 1955 (603–21). 21 refs. [Croat.croat.f.]

In an Oak stand at Krstovi in Slavonia (6·14 ha.; 2004 trees of which 1994 are *Q. sessiliflora*; age 90–100 years; 447 cu.m./ha. of *Q. sessiliflora*; b.a. 32·6 sq. m./ha.; alt. 200 m.; annual precipitation 653 mm.; mean annual temperature 11·1°C.) 678 increment cores were taken from as many stems by Pressler's borer, and the width of the last 10 growth rings was measured in each core. From the mean annual diameter increment, the volume increment was calculated by the following methods: (1) Hufnagl, (2) recruitment rate, (3) K. P. Davis's graphic method and (4) Meyer's differential and increment % methods. Finally the mean recruitment period was determined and also the volume increment % by the method described in a previous paper [cf. *F.A.* 16 No. 2055]. It appears that this method and Meyer's increment % are easiest to use.

769. Ilvessalo, Y. **Variations of growth due to climatic conditions and their consideration in growth studies.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/20, 1956. pp. 6. [E.]

Gives some examples from the 2nd and 3rd Finnish forest inventories.

770. Voegeli, H., and Reinhart, O. Ergebnisse von Jahrringmessungen aus gleichaltrigen Föhrenbeständen. [**Results of annual-ring measurements in even-aged Scots Pine stands.**] *Schweiz. Z. Forstw.* 107 (7), 1956 (407–15). [G.f.]

Comparisons of increment cores taken in 1955–56 from four 80-year-old Pines which had been completely freed in 1950–51, and from 11 controls from closed parts of the same stand, showed significant increases in ring width and particularly in the proportion of early wood in the former, even though these were small-crowned. The effect of drought years and seasonal distribution of precipitation on early- and late-wood growth is also tabulated.

771. Eidem, P. Tidfesting av gammelt bygningsmateriale fra Flesberg i Numedal. [**Dating of old building material from Flesberg in Numedal.**] *Tidsskr. Skogbr.* 64 (2), 1956 (96–116). 11 refs. [Nor.nor.e]

Approximately 23,500 measurements were made on 12,200 growth rings of Scots Pine. A standard series for the years 1815–1954 was based on 11 discs from trees felled in 1951 plus borer samples from 11 standing trees. The correlation between this series and that for E. Norway previously published by Ording [see *F.A.* 5 p. 144] was sufficiently high for Ording's series to be used in dating 77 beams from 8 houses in Flesberg. The oldest material was in two wall beams, with the earliest growth rings dating back to 1383 and 1394. [Cf. *F.A.* 15 No. 561.]

562. Volume Increment

See Nos. 730, 769, 789–90, 794.

566. Yield Tables and Their Construction

772. Kabzems, A., and Kirby, C. L. **The growth and yield of Jack Pine in Saskatchewan.** *Tech. Bull. For. Br. Sask.* No. 2, 1956. pp. 66. 14 refs.

The estimated 18 million cords of Saskatchewan *Pinus banksiana* (the leading conifer by volume) stand on 1·4 million acres of the accessible commercial forest, corresponding to 13% of its area and 33% of the merchantable volume of conifers. The 1953 products were worth > $1 million. Present utilization could be increased 2·7 times by felling down to 4 in. diam. Best regeneration is obtained by clear felling, and scattering slash with some soil scarification. Pulpwood thinnings are available at 40 years but maximum fibre production is at 67–77 years. The rotation for sleepers, poles, and lumber is 85–95 years. Yield tables for 3 sites (with indexes of 57, 45 and 33; reference year 50) are presented with soil and ecological data and stand and volume tables for average sites. Silviculture and destructive agencies are treated in detail.

773. Staebler, G. R. **Gross yield and mortality tables for fully stocked stands of Douglas Fir.** *Res. Pap. Pacif. Nthwest For. Range Exp. Sta.* No. 14, 1955. pp. 20. 4 refs.

[Cf. *F.A.* 17 No. 1860.] Tables for fully stocked Douglas Fir stands, showing for 5 site classes the b.a. and volume in cu. ft. and bd. ft. (both International and Scribner rule), all per acre, of gross yield, periodic annual mortality, cumulative mortality, and mean annual gross increment.

774. Duff, G. **Yield of unthinned Douglas Fir, Corsican Pine and Ponderosa Pine in New Zealand.** *N.Z. For. Res. Note* No. 5, 1956. pp. 40. 4 refs.

Provisional yield tables are presented for New-Zealand-grown fully-stocked stands of *Pseudotsuga taxifolia*, *Pinus nigra* var. *calabrica*, and *Pinus ponderosa*. As well as the usual information on the growth of height, basal area, and volume, stand and stock tables are included and the relationship

between total stem and merchantable volumes is shown. The number of stems, mean d.b.h., basal area, and volumes are shown separately for 6 × 6 ft. and 8 × 8 ft. planting distances. For greater flexibility in use, the tables are arranged differently from conventional yield tables in that the detailed estimation of present or future yields is based directly on mean top height. The only variable directly related to age is mean top height; this relationship is shown in an alignment chart for each species. Derived yield tables of the conventional type are included for general purposes. The preparation of the tables, accuracy tests, and application under different conditions are described. *From author's summary.*

567. Stand Tables

See Nos. 772, 774.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also Nos. 757, 767, 786–7.

775. ERTELD, W. Der Zuwachs der Kiefer als Folge innerer Veranlagung und als Ausdruck erkennbarer Merkmale. [**The increment of Pine as a result of its genetic constitution and as expressed in recognizable characters.**] *Arch. Forstw.* 4 (5/6), 1955 (511–22). [G.]

Sample plots, 10 × 10 m., randomly selected in 8- to 35-year stands of Scots Pine, planted at 1·3 × 0·3 m. on similar sites, were clear felled after recording tree classes according to Kraft, the 4-class Eberswalde system and Nesterov's classification [see *F.A.* 17 No. 407]. The intention of this last system is to recognize by external characters the trees that will maintain or improve their tree-class status and make the best final growth. It distinguishes 3 classes—I and II forming part of the canopy, and III backward trees. Class I contains the trees of the greatest height, diameter, and crown and root growth; II those showing medium values. Each class is divided into (*a*) 'retarded' or late developers and (*b*) fast developers. These are distinguished by external characters which are detailed. The felled stems of the sample plots were analysed. Graphs of height/age for the trees classified by the Eberswalde system do not bring out differences in the course of development; height-increment graphs for trees classified on the Eberswalde and Kraft systems show, for the material examined, the increments of the lowest tree class overtopping those of the best classes between the 10th and 14th year. With the Nesterov classes, differences between subclasses (*a*) and (*b*) begin to show up in the curve of height/age; they are clearly distinguishable in that of height increment, and become greater from Class I to Class III. With the equation: 15·9% of growth finally attainable = sum of current increment to its culmination, a statistically based forecast of the course of growth in the 35-year plot shows that Class I (*a*) and Class II (*a*) trees should overtake trees of their (*b*) sub-classes in the 20–25th and 35–40th years respectively. At 100 years Class I (*a*) and Class II (*a*) should be respectively 6 and 3 m. higher than I (*b*) and II (*b*) stems. Published stem analyses of mature trees of similar diameter from the same stands are used for further comparison of the course of growth, and the requirements for future studies are outlined.

776. SUSMEL, L. Leggi di variazione dei parametri della foresta disetanea normale (*Abies-Picea-Fagus*; *Picea*). [**Laws of variation of the parameters of normal, uneven-aged selection forest (*Abies-Picea-Fagus*; *Picea*).**] *Ital. for. mont.* 11 (3), 1956 (105–16). 12 refs. [It.it.f.] (Also French version—[*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/16. pp. 14 + 4 gphs.)

On the basis of statistical data from a number of alpine and sub-alpine selection forests in Italy, France, Switzerland and Jugoslavia, the author derives values for the following parameters, all expressed as functions of stand height (taken as mean height of dominants): K (= ratio of number of trees in any diameter class to that in the next lowest class); crown volume in cu.m./ha.; crown projection in sq. m./ha.; basal area in sq. m./ha.; stand volume in cu.m./ha.; mean diameter in cm.; maximum diameter in cm.; volume increment %; number of trees. The results show that, in normal selection forest, all the parameters vary with stand height, except number of trees which is almost constant, and that, for any given stand height, there is a more or less fixed value for each parameter which does not vary within the geographical limits of this study.

58. Surveying and Mapping. Aerial Surveys

See also No. 618.

777. VOLKERT, E. Auswertungsmöglichkeiten der Standortkartierung für die Forsteinrichtung. Am Beispiel des Landes Rheinland-Pfalz erläutert. [**Possibilities of site-mapping for forest management, as exemplified by the Palatinate.**] *Forstarchiv* 25 (2), 1954 (30–5). 11 refs. [G.]

Discusses briefly the site mapping of clear-felled areas in the Palatinate in 1951 and the climatic and soil survey of 9 forest areas there in 1952 in relation to their contribution to the comprehensive site-mapping project in progress in the Palatinate since 1953. The principles and probable form of this operation are also outlined.

778. STARR, W. A., *et al.* **Evaluating and mapping mountain land features for forest management purposes.** *Sta. Circ. Wash. St. agric. Exp. Sta.* No. 271, 1955. pp. 22. 15 refs.

Describes the combination of field work and interpretation of aerial photos, and the legends and symbols used on maps, that have been developed for making rapid and extensive surveys of soils and topography in mountainous forest areas of Washington.

779. SPURR, S. H. **Forest photogrammetry and aerial mapping: a bibliography 1887–1955.** School of Natural Resources, University of Michigan, Ann Arbor, Michigan. 1956. pp. 60.

Divided into sections as follows: (1) all countries 1887–1918; (2)–(5) 1918–44 separately for U.S.A., Canada, Europe, other parts of the world; (6)–(9)

1944–55 as above; (10) unpublished theses from U.S.A. and Canada.

780. BAUMANN, H. **Aerial photography as a practical aid for forest inventory.** *Transl. Fac. For. Univ. B.C.* No. 16, 1956. pp. 8. Transl. by C. R. Hacker from *Allg. Forstzeitschr.* 9 (27/28), 1954 (297–300).

Discusses the value of aerial photography (e.g. in determining age, species, crown closure, roads, ditches etc.) its practical application, the use of a projector for transferring details from the photograph to a map, technical requirements (time and scope of flight, photographic equipment and methods), and costs.

781. **Report to the Government of Iraq on aerial photographs for forestry purposes in Iraq.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 537, 1956. pp. 21. Limited distribution.

782. COLLINS, J. R. **Use of the Old-Delft scanning stereoscope for interpretation and plot analysis.** *For. Chron.* 32 (2), 1956 (258–60).

Describes a new type of stereoscope, designed primarily for military purposes, but which has been tested and found satisfactory for forestry use. Advantages are dual magnification ($\times 1\frac{1}{2}$ and $\times 4\frac{1}{2}$) and possibility of shifting the field of view by turning a knob, without losing stereo vision. The main disadvantage is the high cost of the instrument —$850.

783. LITTLE, E. L., JR. **The helicopter for tropical botanical field work.** *Ecology* 37 (3), 1956 (607–9). 2 refs.

Discusses, on the basis of experience in British Guiána, the use of helicopters for visual reconnaissance, collection of botanical specimens, identification of tree species etc.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

784. **Forest management in plan and practice: Proceedings of the 5th annual forestry symposium, Louisiana State University, Baton Rouge, Louisiana, 5–6 April 1956.** School of Forestry, Louisiana State University, Baton Rouge, La. 1956. pp. 93.

Includes a number of papers, of a somewhat general nature, on problems of management of Pines and hardwoods in the Southern states.

61. Forest Management: General, Theory and Principles

See also No. 772.

785. WALKER, N. **Growing stock volumes in unmanaged and managed forests.** *J. For.* 54 (6), 1956 (378–83). 17 refs.

A discussion of the terms 'fully stocked stands' and 'full increment' and of the structure of unmanaged and managed even-aged normal forest and managed uneven-aged forests, using local data on Loblolly Pine, Oak, and Douglas Fir and comparing data for the two latter species with figures from Germany and Denmark respectively.

786. MEYER, H. A. **Growth and drain in uneven-aged forests.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/12, 1956. pp. 6 + 2 gphs.

Discusses the structure and development of uneven-aged forests, regarding them essentially as a population of trees grouped according to characteristic d.b.h. patterns. Diameter distribution is studied and expressed by an exponential function of the form $YdX = k.e^{-aX}\,dX$, where YdX = number of trees in a narrow diameter interval dX, X = d.b.h., e = base of natural logarithms, and K and a are constants characterizing a given structure. It can be shown that the numbers of trees in successive diameter classes of a diameter distribution of this type represent a geometric series. The effect of annual diameter growth is to displace the distribution curve to the right, which results in an increase in number of trees in all classes. This increase is given by the formula: Increase = $N(q^{1/2}-1)$, where N is the initial number of trees contained in the class, I is the average diameter growth for the class, and q is the quotient between number of trees in successive 2-in. diameter classes. The applications of these formulae in forest management are discussed and illustrated.

787. BOUDRU, M. Quelques exemples de futaie jardinée de chêne. [**Some examples of Oak selection forest.**] *Bull. Inst. agron. Gembloux* 24 (2), 1956 (109–20). 7 refs. [F.] E.M.B.

Quotes the findings of Meyer in Pennsylvania with regard to balanced growing stock in Oak forest [see *F.A.* 14 No. 563], compares them with his own theoretical study [see *F.A.* 15 No. 185] and that by Galoux [see *F.A.* 15 No. 3928], and discusses the application of Meyer's findings to European conditions.

788. HUMMEL, F. C. **The possibilities of wider espacements and shorter rotations for conifer plantations in Great Britain.** *J. Oxf. Univ. For. Soc.* (*Ser. 4*) No. 4, 1956 (13–8). 7 refs.

Defines current practice, briefly describes the effects of varying the spacing and rotations, and discusses some of the considerations of forest management that affect the issue. It is concluded that no major departures from standard practice are likely to be called for in the majority of plantations, but that in special cases heavier thinning and shorter rotations may be called for.

789. ROUSSEL, L., and LEROY, R. Relations statistiques entre la production et le capital sur pied dans les sapinières. [**Statistical relationships between increment and growing stock in *Abies alba* stands.**] *Bull. Soc. for. Franche-Comté* 29 (2), 1956 (57–81). 12 refs. [F.]

The two authors, having independently discovered, in widely separated regions (Doubs and Alpes Maritimes), that the c.a.i. of Silver Fir is directly related to volume/ha. [cf. *F.A.* 16 No. 3287; 8 No. 2175] decided to make a more detailed study of the relation, which is of particular interest at a time when the general trend of management is towards shorter rotations and smaller dimensions. For this purpose they analysed working-plan data from three groups of forests (1) in the Jura (< 900 m., 900–1100 m., > 1100 m.), (2) in the Pyrenees, (3) in the Dauphiné Alps. It was found in all cases that low volumes/ha. were associated with low c.a.i., and high volumes/ha. with high c.a.i., the coefficient of correlation between the two values ranging between + 0·55 and + 0·70 which, since it is based on numerous measurements, is regarded as highly significant. The following general observations are made: (*a*) This partial correlation of increment with volume/ha. is much stronger than that with site or size of tree. (*b*) High vol./ha., large trees, and 'good' sites are often associated and are positively and significantly correlated with one another. (*c*) There is a marked, though not highly significant, negative correlation between rates of increment and mean volume of trees, related no doubt to the fact that the larger trees are often the older. The applications of these findings to the management of Silver Fir, both pure and in mixture with Spruce, are discussed in detail.

790. POPESCU-ZELETIN, I., and DISSESCU, R. Neues Verfahren zur Bestimmung des Haubarkeitsalters bei Fichtenbeständen. [**A new method of determining the age of exploitability in Spruce stands.**] *Rev. Biol., Bucarest* 1 (1), 1956 (127–39). 18 refs. [G.g.] C.G.B.

The method developed by the authors involves the use of a nomogram relating mean d.b.h. and site class to age. It has been shown that the relation between merchantable volume and total volume and total volume of the mean tree does not vary with height. The stand mean tree, on which the % of merchantable volume depends, remains characteristic for the whole stand, irrespective of stand structure (virgin, quasi-virgin, and even-aged), and in general gives almost the same results (1–5% higher) as those derived from the whole stand (minimum d.b.h. 8–18 cm., maximum 30 cm. > mean d.b.h.). The present study was made only on Spruce (based on measurement of 4130 trees and 540 sample plots) but it is considered probable that the results would also prove true of other species.

791. DUERR, W. A., FEDKIW, J., and GUTTENBERG, S. **Financial maturity: a guide to profitable timber growing.** *Tech. Bull. U.S. Dep. Agric.* No. 1146, 1956. pp. 74. 19 refs.

Explains and illustrates the principle of financial maturity and its application to various systems of management; *Pinus taeda* managed on a selection system is used as the primary illustration. It is recommended that foresters should accumulate their own data on timber quality and growth and their own logging and milling costs. Since, however, this may not always be feasible, data for average conditions are summarized and condensed into simplified marking guides for the main types of the Southern U.S.A.: Loblolly/Shortleaf Pine; bottomland Red Oaks/Sweetgum; and upland Oaks/Tulip Tree. The mathematical analysis, given in an appendix, demonstrates that the principle of financial maturity is consistent with the traditional soil-rent theory. Its great practical advantage is the ease with which marking guides can be formulated. *From authors' summary.*

792. FEDKIW, J., and YOHO, J. G. **Financial maturity—what's it good for?** *J. For.* 54 (9), 1956 (587–90). 11 refs.

Describes a method of estimating the maturity of a tree based essentially on (*a*) the value of the tree and its expected value increment before the next felling, and (*b*) the alternative rate of return expected by the owner. If (*b*) exceeds (*a*) the tree is financially mature.

793. LANG. Massennachhaltigkeit und Entwicklung zur Wertnachhaltigkeit. [**Sustained yield by volume and the development of sustained yield by value.**] *Forst- u. Holzw.* 11 (13), 1956 (267–70). Many refs. [G.]

A discussion, based on the literature, of the problems involved, describing various German and Swiss systems, and measures to promote the production of valuable, large timber, more particularly for Beech, with examples from the author's working district in Hesse.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also No. 764.

794. ABETZ, K. Der ertragsgeschichtliche Zuwachs und seine Bedeutung für die Forsteinrichtung. [**The significance of recorded yields for forest management and the determination of increment.**] *Allg. Forst- u. Jagdztg* 125 (4), 1954 (141–6). [G.e.]

Discusses the use of records of past fellings in arriving at m.a.i., and hence at the annual cut, as an alternative or supplementary method to yield tables, increment borings and control methods, and the problems involved—changes in measuring system, changes in compartments, type of forest or stocking, etc.—and concludes that they will be of increasing importance.

795. SAARI, E. **Freedom of choice in the determination of the possibility (allowable cut) of a country.** *Indian For.* 82 (8), 1956 (427–9).

The problem of determining the possibility for a management unit is in part the same as that of calculating the possibility for a whole country. However, the latter also involves a number of other problems, since the effect of forestry and variations in the annual cut must be taken into consideration. The paper discusses certain principles involved in this question in three different types of conditions: (*a*) a country with excess growing stock, (*b*) a country with normal or optimal growing stock, (*c*) a country with growing stock below normal. Finland, with its northern half of the first type and its southern half of the third type, is an interesting example. *Author's summary.*

796. SAGREIYA, K. P. **Brandis' method of yield regulation.** *Indian For.* 82 (6), 1956 (271–85).

Gives a mathematical analysis of Brandis' system, applies it to a typical Madhya Pradesh forest containing 25% Teak, and criticizes other writers' application of the method [cf. *F.A.* 15 No. 575; 17 No. 1878].

797. TIWARI, S. D. N. **The working capital and other formulae for the yield regulation in selection forests. Part II.** *Indian For.* 82 (8), 1956 (420–2).

Modifies and clarifies the formulae developed in a previous article. [Cf. *F.A.* 17 No. 1878.]

798. LIHTONEN, V. **Rental cutting: a method of regulating the cut for progressive forest yield.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/25/19, 1956. pp. 7. 3 refs. [E.]

Describes the methods used in Finland, with an actual example. The factors taken into account are actual forest area of the unit, tree species, age structure of stands in 10- or 20-year intervals, volume of growing stock by age classes, increment of growing stock as volume increment %, area to be regenerated during the regulatory period, and silvicultural condition of the forest.

799. JOHNSON, F. A., and HICKS, V. E. **Estimating allowable cut without a type map in forests of Western Washington and Western Oregon.** *J. For.* 54 (8), 1956 (522–4). 3 refs.

Describes and discusses a method based on systematic sampling, plots of 0·5 × 10 chains being located on aerial photos covering the whole working circle. The information required was computed from 8 interlinked formulae, leading to an empirical yield table (for area/volume check) and substitution in Hanzlik's formula of the values found. Both sampling errors and survey costs were about the same as for the conventional method, when tested on two National Forest Working Circles.

800. SUSMEL, L. Riordinamento su basi bio-ecologiche delle abetine di S. Vito di Cadore. **[Working-plan revision, on an ecological basis, for the Spruce/Fir/Beech stands of S. Vito di Cadore.]** *Pubbl. Staz. sper. Selv. Firenze* No. 9, 1955. pp. 157 + separate map. [It.f.g.]

Part 1 gives an account of the environment, particularly soils and soil degradation and vegetation, and classification into site classes and yield classes; part 2 describes the present condition of these mixed stands of somewhat anomalous structure; and part 3 is a revision of the working plan.

64. Forestry as a Business: General

See also Nos. 1170, 1191–2, 1202.

801. HASEL, K. Volkswirtschaftliche Leistungen und Leistungsmöglichkeiten im Kleinprivatwald. **[Economic productivity, actual and potential, of small private forest holdings.]** *Allg. Forst- u. Jagdztg.* 125 (3), 1954 (89–94). [G.e.]

Discusses the concepts involved, statistical data available, and the reason for small annual cuts and smaller m.a.i. as compared with large managed forests. Maturing of existing growing stock, and conversions of low-yielding broadleaved stands and increased advisory services should make increased yields possible, but the peculiarities of small-scale enterprise, subordination to farm needs, etc. make it unlikely that they will ever approach those from forests in other ownership.

802. ABETZ, K. Betriebswirtschaftliche Zusammenhänge zwischen Land- und Forstwirtschaft innerhalb bäuerlicher Betriebe. **[Relationship between agriculture and forestry on farms.]** *Proc. 11th Congr. int. Union For. Res. Organ., Rome 1953*, 1954 (875–81). [G.]

Discusses the role of forest lands in the economy of small and medium mixed farms, e.g. as providers of timber and fuel for home consumption, as pasture, and as a source of income or economic reserve, and the implications which these functions and the fragmented nature of many holdings, have for management.

803. MACGREGOR, J. J., and IRVINE, T. W.; BALMAN, F. E. **Survey of private forestry prices, England and Wales. Second Report 1955. Part I. Round timber prices. Part II. Minor forest produce prices.** Imperial Forestry Institute, Oxford. 1956. pp. 39. Price 7*s.* 6*d.*

The first report, for 1954, is no longer available, but the results for timber prices are incorporated in this report. The data on which the report is based were derived from 125 estates and cover 979 separate sales.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 187, 385, 402, 434–5, 437, 791–3.

804. MACGREGOR, J. J. **Forestry costs on private estates.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/31/6, 1956. pp. 8. 4 refs.

805. KER, J. W. **Costing in forest operations in British Columbia.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/31/4, 1956. pp. 5.

806. MARKUS, R. **Stand establishment costs and the theory of relative forest rent.** *J. For.* 54 (8), 1956 (503–5). 4 refs.

Invokes the arguments of E. Ostwald (*Grundlinien einer Waldrententheorie*, 1932) to refute the validity, in sustained management, of considering stand-establishment costs as working capital to be returned compounded by the final yield (implicit in the soil-expectation-value formula) instead of taking the *initial* establishment costs as a fixed investment, like the soil itself. Omitting intermediate fellings and annual expenses as irrelevant to the present argument, the standard formula may be rewritten as:

$$S \cdot \frac{Y - c}{(1 + p)^m - 1} \quad c,$$

where the first c is associated with Y at the end of the rotation m, and the last c is the initial outlay at

age zero. Calling the former c_m and the latter c_0 and transposing, Ostwald has

$$S + c_0 = \frac{Y - c_m}{(1 + p)^m - 1},$$

where the initial establishment cost is associated with the soil capital S as an indivisible unit, but the subsequent reproduction (re-establishment) costs, being capital maintenance costs, are charged to the final yield Y. Now, since c_0 represents the stand value at age zero, the left side of Ostwald's equation signifies the forest capital which in m years produces a forest rent $Y - c_m$, or mathematically,

$$(S + c_0)[(1 + p)^m - 1] = Y - c_m.$$

This view considers the growing stock to be a fixed investment and not, as in soil-rent theory, the working capital; the production cycle is completed only when the new crop has been established, in accord with the requirements of sustained yield forestry, i.e. the stand perpetuates itself not only biologically but economically as well.

807. BORNAND, G.-H. La rentabilité du peuplier. **[The financial yield of Poplars.]** *Schweiz. Z. Forstw.* 107 (8/9), 1956 (458–66). [F.g.]

An analysis of quantities cut, assortments obtained and prices realized from Poplars grown in a mixed bottomland forest bordering Lake Murten (Neuchâtel), over a number of years, and recommendations for making Poplar-growing more profitable.

808. SCHREVEL, M. De omloop van de groveden. **[The rotation of *Pinus sylvestris*.]** *Ned. Boschb.-Tijdschr.* 28 (6), 1956 (129–40). 7 refs. [Du.g.]

Rotations were calculated for Scots Pine on site classes I–V in the Netherlands, using the yield tables of Grandjean and Stoffels and prices for 1953–54 and 1954–55. Means for the different site classes were: maximum volume rotation, 45–65 years; rotation of highest income 60–80 years; financial rotation 50–55 years. For all 3 methods, the length of the rotation increased with decreasing site quality. Tabulated figures show the value of the final crop and of thinnings for different diameters and site classes I–V.

809. VINEY, R. Rentabilité des reboisements de pins. **[Profitability of afforestation with Pines.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/31/8, 1956. pp. 7. [F.]

Gives calculations for a plantation of *Pinus sylvestris* to be clear felled at 55 years, and one of *P. pinaster* for resin-tapping, to be felled at 72 years.

810. MCCLAY, T. A. **Economic considerations in Douglas Fir stand establishment.** *Res. Pap. Pacif. Nthwest For. Range Exp. Sta.* No. 15, 1955. pp. 10. 1 ref.

Rough estimates of costs based on actual cases are presented for planting, direct sowing, stand release and slash burning, and also simple valuation techniques for determining the cheapest method of stand establishment where several alternatives are possible. The economic merits of establishment by planting and by natural regeneration are weighed and discussed. On a site-I area with the possibility of good returns from intermediate harvests, immediate planting is advisable.

811. LETOURNEUX, C. Éléments des coûts des opérations forestiers. **[Costing forestry operations [in tropical Asia].]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/31/5, 1956. pp. 4. [F.]

Analyses costs for different types of plantation (e.g. Teak by the taungya system, direct sowing of *Acacia mollissima*) in Indochina, Ceylon and Siam.

812. HERMANSEN, N. K. Forenklet skovvurdering. **[Simplified forest valuation.]** *Dansk Skovforen. Tidsskr.* 40 (4), 1955 (172–83). [Dan.e.]

In the method described, a straight line is drawn on semi-logarithmic paper (logarithmic value as ordinate, age as abscissa) between two points (*a*) sum of net value of final fellings + value of land + capitalized overheads, at rotation age, and (*b*) the same sum discounted to the year 0. This is called the 'discounting curve', and if no thinnings were made it would give the expectation values of the plantation. Net receipts from thinnings in the oldest age-class concerned are added on to the discounting curve at the middle year of that age-class. From the point so obtained, and parallel to the discounting curve, a straight line is drawn to intersect the mid-line of the next lower age-class, and the value of the corresponding thinnings is added to the point of intersection. This procedure is repeated downwards for all thinnings and the resulting serrate curve is smoothed to give the final curve. Stand expectation values read from the last must be reduced by an amount equal to capitalized overheads. The principles of the method are discussed in detail and an example is given of its use.

813. HERRICK, A. M. **The quality index in hardwood sawtimber management.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 632, 1956. pp. 26. 22 refs.

Illustrates the use of the 'price relative' [see *F.A.* 16 No. 4736] and the Quality Index (QI) derived from it, and gives useful forms of QI data graphically and in tables based on all available lumber-grade yield data from Indiana. The applications of the QI concept to stumpage appraisal are then illustrated separately, (*a*) by individual logs, (*b*) by trees (deducting costs in each case) and (*c*) by conversion surpluses (product-value minus direct cost of conversion) for individual trees. The application of (*c*) to tree marking, where silvicultural considerations are not overriding, is then discussed. All relative data are detailed in appendices.

814. JØRGENSEN, F. Konkurranseforholdet mellom jordbruk og skogbruk sett i relasjon til den nye jordloven. **[The competing claims of farming and forestry in relation to the new Land Use Act.]** *Norsk Skogbr.* 2 (13), 1956 (433–43). 12 refs. [Nor.]

Gives examples, illustrated by graphs and tables, of calculating the profits to be expected from maintaining land under forest or converting it to agriculture (1) as a new farm, (2) as an addition to an existing farm or (3) as an addition to a holding to make an independent family farm, or from

planting trees on existing farmlands. Such analyses are called for in cases of pre-emption or expropriation under the Norwegian Land Act of 18 March 1955.

815. SPEER, J., and MERKLE, R. Die Bewertung von Forstbetrieben in Deustchland. [**The valuation of forest enterprises in Germany.**] *Proc. 11th Congr. int. Union For. Res. Organ., Rome 1953*, 1954 (907–12). 8 refs. [G.]

Discusses the formulae used in Germany for valuing forest enterprises, in whole or in part, for purposes of compulsory purchase etc. and, more specifically, for taxation.

816. SPEER, J. Probleme der Gewinnermittlung in forstwirtschaftlichen Betrieben für Zwecke der Einkommenssteuer. [**Ascertaining the profit of forestry undertakings for income-tax purposes.**] *Allg. Forst- u. Jagdztg.* 125 (4), 1954 (120–6). 7 refs. [G.e.]

A discussion of the problems raised by proposals to amend German income-tax laws regarding forestry, now based on 'annual cut', according to accepted sustained-yield management principles, stressing both technical and theoretical (legal) difficulties in arriving at a figure for annual value increments.

817. REINHOLD, M. Die Einheitsbewertung forstwirtschaftlicher Betriebe. [**Assessment of forest enterprises [for taxation].**] *Forstarchiv* 25 (2), 1954 (25–9). 35 refs. [G.g.]

818. DORIGUZZI, G. La Valle Visdende in Comelico: indagini sull' andamento dei prezzi di macchiatico nel cinquantennio. [**The trend of stumpage values in the Visdende Valley in Comelico during 50 years.**] *Monti e Boschi* 7 (8), 1956 (343–54). [It.]

Analyses the stumpage values in these Spruce/Silver Fir forests in 1912, 1929 and 1955. The great increase in these values has resulted in serious overfelling during this period.

819. KALBHENN, A. Massenertrag und Geldertrag. [**Volume yield and [gross] financial yield.**] *Allg. Forst- u. Jagdztg.* 126 (2/3), 1955 (40–6). [G.g.e.]

A detailed statistical analysis in terms of volume and value, of yields in an Odenwald district, covering 20 years. Thinning yields corresponded well with Wiedemann's and Wimmenauer's tables. Admixtures of conifers in Beech raised intermediate yields. Beech exceeded Pine and Spruce in total yields by both volume and value [site differences not considered]. Mean prices per solid cu.m. differed little by age class (there was little valuable timber). Hence high volume production in mixed stands is the policy recommended. *From author's summary.*

66. Costing of Logging Operations

See also Nos. 804–5.

820. ROACH, B. A. **Logging costs for Central hardwoods.** *Sth. Lumberm.* 193 (2409), 1956 (53–4).

A preliminary study from Kaskaskia forest, S. Illinois, involving chain-saw felling and tractor logging. While timber size and topography affected costs, volume cut per acre, within broad limits, did not. At prevailing costs and prices, improvement fellings should pay for themselves.

821. **The costing of powered vehicles and machines.** [*Publ.*] *FAO/ECE Jt. Comm. For. Working Tech.* No. *FAO/EFC/LOG*/58, 1956. pp. 10.

Gives a system of costing, drawn up by the Study Group on Tractor Testing, to cover (1) cost per hour, per km., and per mile, (2) depreciation and repair costs, (3) vehicle or machine costs directly incurred while working, (4) wages and associated expenditure, for vehicles and machines, wheeled or otherwise, that contain their own power unit.

822. Le prix de revient de l'exploitation forestière au Gabon et au Moyen-Congo. [**Cost prices of forest exploitation in Gabon and the Middle Congo.**] *Bois For. Trop.* No. 48, 1956 (39–49). [F.]

Summarizes the conclusions of an official inquiry into costs for producing Okoumé [*Aucoumea klaineana*] and Limba [*Terminalia superba*] logs, with suggestions for possible ways of reducing them.

67. Assessment of Financial Results; Bookkeeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also No. 1199.

823. CORMACK, W. M. **Management accounting in the Forestry Commission (Great Britain).** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/31/3, 1956. pp. 5 + [9].

An analysis of the accounting system used, with specimen forms for statements of accounts of estate expenses, direct overheads, local supervision and administrative and control overheads, preparation and sale of timber, and silvicultural operations.

824. MACGREGOR, J. J., BALMAN, F. E., and IRVINE, T. W. **Woodland accounts and costing.** *Quart. J. For.* 50 (3), 1956 (197–204).

In connexion with its 'Survey of Private Forestry Costs: England and Wales' [cf. *F.A.* 15 No. 277], the Forest Economics Section of the Department of Forestry, University of Oxford, has evolved a series of costing forms, designed so as to give the estates preparing them the minimum amount of additional work. These forms and the method of preparing them are described, with a brief account of the sequence of the analyses of the data obtained from the forms. *From authors' summary.*

825. MELZER, E. Fragen des forstlichen Erfolgsnachweises in Zusammenhang mit dem derzeitigen Stand der Planung und des Rechnungswesens in den Staatlichen Forstwirtschaftsbetrieben der DDR. [**The assessment of financial results in forestry in the context of contemporary planning and accounting in the State forest enterprises of the German Democratic Republic.**] *Arch. Forstw.* 4 (5/6), 1955 (439–66). 18 refs. [G.]

Outlines the replacement of double-entry systems by detailed costing in W. Germany (Hesse, Rhineland Palatinate, Lower Saxony), and in E. Germany, where the new system is now general for state forests. Examples of the forms and a diagram showing the organization are appended. The working-plan prescriptions and their estimated costs,

are entered on the same pages as the actual costs and detailed examples are given of the regeneration and primary conversion plans and costings for a number of undertakings.

826. WILCKENS, H. A. Rationalisierungsfragen in der Staatsforstverwaltung. [**Problems of rationalization in the administration of state forests.**] *Forst- u. Holzw.* 11 (15), 1956 (315–8). [G.]

Chiefly a description of the use of punched-card systems for the preparation of important statistics, e.g. assortments, wages and costs, stressing their use for the officer in the districts and divisions, and denying that the preparation of the necessary material requires undue extra work, as most of the data are needed for efficient accounting in any case.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

827. [**Establishment, duties, organization, administration, staff and lands of the newly constituted Forestry Commission.**] *Rep. S. Rhod. For. Comm. 1954/1955*, 1956 (1–8). 1 ref.

Established under the Forest Amendment Act No. 28 of 1953 with effect from 1 April 1954.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

828. PETERNEL, J. Šumske komunikacije u NR Hrvatskoj. [**Forest communications in Croatia.**] *Šum. List* 79 (11/12), 1955 (428–35). 2 refs. [Croat.]

Forest land occupies 44·7% of the area of Croatia, but only 75% of it is covered with forest. Of this, 54·9% is under intensive management, 10·2% semi-intensive management, 8% inaccessible, and 26·9% under maquis. The total length of communications (3560 km. of forest roads and 1867 km. of forest rail and cableways) gives, in relation to the area of worked forest (1·4 million ha.) a ratio of 3·9 km./1000 ha.

829. KLEMENČIĆ, I. Optimale Dichte des Verkehrsnetzes im Walde. [**The optimum density of the communications network in the forest.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/32/2, 1956. pp. 5. [G.g.] (And English summary, separately, as No. *IUFRO*/56/32/103, pp.2.)

830. KUDELA, M. K otázce elektrovodů v lese. [**The problem of electric power transmission through forested areas.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 28 (5), 1955 (761–70). 4 refs. [Cz.cz.russ.f.]

A general discussion of factors to be considered. Tables are given showing the regulation width of clearing for Spruce, Scots Pine, Beech and Oak of 3 site classes, and the capital loss involved per km., for Spruce and Scots Pine.

687. Planning and Organization of the Transport of Men, Supplies and Equipment

See No. 724.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

831. **Timber industry in Europe: statistics for 1955: trends for 1956.** Organisation for European Economic Co-operation, Paris. 1956. pp. 134.

Part I analyses the trend of the timber market in 1955, and Part II the prospects for 1956. Part III is a study of some particular problems: (1) imports from N. America, (2) incidence of sawnwood prices on the level of consumption, (3) the situation in the saw-milling industries, and (4) fluctuations in timber prices in recent years. The statistical appendix contains 29 tables.

71. Marketing of Forest Products: General

See also No. 1113.

832. O pinho do Paraná no mercado britânico. Posição estatística, consumo atual e futuro—análise da situação local e posição do produto no Reino Unido. [**Parana Pine in the British market. Statistics, present and future consumption, analysis of the situation and the position of the product in the U.K.**] *Brasil madeireiro* 11 (111), 1956 (20–4). [Port.]

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

833. **T.D.A. year book of timber statistics, 1955.** Timber Development Association, London. 1956. pp. 79.

834. JAY, B. A. **Sizes of timber.** *Wood* 21 (7; 8), 1956 (276–8; 311–3).

Guidance on buying building timber in the U.K., where 90% of the trade deals in lengths of 6–16 ft. and widths of 6–10 in. Tables show the availability of variously dimensioned softwood stock from the Baltic and East and West Canada, and of Parana Pine. The approximate maximum widths obtainable in normal parcels of square-edged timbers imported is also shown. Part 2 gives similar information and a table for hardwoods imported from America, Europe, Asia, Africa and Australia.

835. SCHMELZ, W. Zur Holzmarktentwicklung im Jahre 1954. [**Timber market trends 1954.**] *Arch. Forstw.* 4 (7/8), 1955 (727–34). [G.]

A review of trends in demand, supply, and prices, by assortments, quoting conditions in W. Germany, Austria, Jugoslavia, Rumania, Poland, U.S.S.R., Finland, Sweden, France, Switzerland, Italy and Spain.

836. JAZĪRAĪ, M. H. [**Future of the Walnut tree in Persia.**] *Mon. Bull. Iran. For. Serv.* 7 (1), 1956 (13–5). [Per.]

A short account of the post-war rise in demand, both internal and external, for the timber of *Juglans regia*. Exports have risen from 1637 cu.m. in 1950–51 to 7248 cu.m. in 1953–54 and are still rising; they

now constitute 60–70% of total timber exports. The author considers that there is as yet no danger of a shortage.

837. PFEIFFER, J. R. **The case for northwest hardwoods**. Oregon Forest Products Laboratory, Corvallis, Ore. 1956. pp. 2 + 4 photos.

Gives some estimated figures of available volumes and acreage, net annual growth, and future demand for hardwoods in the North-West Pacific States.

838. HOYLE, R. J. **Changes in the wood-using industries of New York State, 1912 to 1954**. *Sth. Lumberm.* 192 (2405), 1956 (30 . . 34).

Contains salient points from the 5th such survey, made by the University in 1954. Douglas Fir consumption has moved from 34th place in 1912 to 1st place in 1954, followed by Hard Maple and Ponderosa Pine. The use of Southern species has declined, particularly Southern Yellow Pine. [Cf. *F.A.* 12 No. 1238.]

839. CRUIKSHANK, J. W., and MCCORMACK, J. F. **1955 pulpwood production in the South**. *For. Surv. Release Stheast. For. Exp. Sta.* No. 47, 1956. pp. ii + 32.

Covers Pine and hardwood pulpwood production in the territories served by the Southeastern and Southern Forest Experiment Stations, i.e. Alabama, Arkansas, Florida, Georgia, Louisiana, Mississipi, North and South Carolina, Oklahoma, Tennessee, Texas and Virginia.

73. Prices

See Nos. 803, 813, 818–9.

74. Trade Policy

See No. 1199.

78. Economics of Transport

See No. 1199.

79. Economics of the Wood Industries

840. GEVISSER, D. **The integration of forest-products industries**. *J. S. Afr. For. Ass.* No. 26, 1955 (73–6).

The argument is advanced that the future success of the South African forest products industry depends on the maximum expansion, compatible with policy and the yields from their natural areas, of present sawmilling units. Only large agencies can afford the capital for integration and the conversion of the waste that existing units cannot handle.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2, 161, 163, 471, 1174–5, 1207.

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 2, 124, 141, 174, 178, 180, 1016, 1217.

841. Nomenclature des bois tropicaux. II. Amérique du Sud et Amérique Centrale. [**Nomenclature of tropical woods. II. South and Central America.**] Association Technique Internationale des Bois Tropicaux, Nogent-sur-Marne. 1955. pp. 140. [F.E.G.Span.]

The second of this series, compiled after the same pattern as the first. [Cf. *F.A.* 16 No. 2107.]

842. WANGAARD, F. F. **Survey of the properties and uses of tropical American woods: 1947–1955. Final Report**. Yale University School of Forestry, New Haven, Conn. 1955. pp. 16 + [2]. P.R.

[Cf. *F.A.* 17 No. 3172.] Lists the publications containing the detailed results, and other articles relating to this subject; also gives a use classification for tropical woods and an index of species covered in 'Properties and uses of tropical woods, I–V'.

843. TORTORELLI, L. A. Maderas y bosques argentinos. [**Argentine forests and timbers.**] Editorial Acme S.A. C.I., Maipú 92, Buenos Aires. 1956. pp. 910 + 3 plates. Many refs. [Span.] Price SArg.350 [£3.19*s.*].

(1) A review of the different Argentine forest types, their composition and constitution as estimated from sample plots, and their exploitation. (2) Classifications of Argentine timbers according to different characteristics, such as colour, grain, texture, arrangement of the pores, and other anatomical features. (3) A general introduction to the properties of wood. (4) Descriptions of 111 Argentine spp., i.e. a description of the tree, its range, characteristics of the wood (with photomicrograph) and uses. (5) A key to the species, based on wood characteristics.

844. ANDERSON, I. V. **Properties, uses, and production of Engelmann Spruce**. *For. Prod. J.* 6 (8), 1956 (307–11). 11 refs.

Surveys literature on research stimulated by the increased quantities of Engelmann Spruce cut owing to the barkbeetle epidemic in the Northern Rocky Mountains. It remains suitable for pulping up to 15 years after killing.

845. **Specimen woods Nos. 247–249**. *Suppls.* to *Wood* 21 (7–9), 1956. Each pp. 2.

East African Camphorwood (*Ocotea usambarensis*), Ulmo (*Eucryphia cordifolia*), and Rauli (*Nothofagus procera*).

846. FERREIRINHA, M. P. Madeiras do ultramar português. [**Timber from Portuguese overseas territories.**] *Garcia de Orta, Lisboa* 4 (1), 1956 (95–6 + 3 plates). [Port.]

Notes and 3 full-plate coloured photographs in longitudinal section of the wood of *Spirostachys africana*, *Ricinodendron rautanenii* and *Amblygonocarpus obtusangulus*.

847. D. Drei äquatorialafrikanische Hölzer. [**Three timbers from equatorial Africa.**] *Holz-Zbl.* 82 (110), 1956 (1336–7). 9 refs. [G.]

A description of Niove (*Staudtia gabonensis*), Tsonguti (*Alstonia congensis*), and Mukulungu (*Autranella congolensis*), including nomenclature, provenances, habit, timber properties and uses.

848. **Alone.** [***Bombax chevalieri.***] *Bois For. Trop.* No. 48, 1956 (21–4). [F.]

849. La page des bois tropicaux. Douka. [**Tropical woods: *Mimusops africana.***] *Rev. Bois Appl.* 11 (6), 1956 (26). [F.]

850. HUNDLEY, H. G. **Pyinkado: *Xylia dolabriformis*, Benth.** *Burmese For.* 5 (2), 1956 (131–2 + 1 photo). 4 refs.

Description of the tree, its distribution, silvicultural characters and wood properties.

851. BANKS, C. H., and SCHWEGMANN, L. M. **The timber properties of *Eucalyptus oreades* R. T. Baker (= *E. altior* Maiden).** *J. S. Afr. For. Ass.* No. 26, 1955 (70–2). 4 refs.

Gives a description of the wood, its structure, and its mechanical and working properties. Short lengths, frame-sawn at 90% moisture content were subject to severe splitting; lengths of 20 ft. and more varied. One- and 2-in. thicknesses season well. Its uses are floor blocks and general construction.

852. KRYN, J. M. **Information leaflet. Foreign woods. Yemeri, *Vochysia hondurensis* Sprague.** *Rep. U.S. For. Prod. Lab., Madison* No. 1946 (rev.) 1956. pp. 8. 7 refs. P.R. [Cf. *F.A.* 15 No. 4000.]

853. KANZLER, R.; BAUER, F. Die Verwertung von Roteichenstammholz. [**Utilization of *Quercus borealis* logs.**] *Holz-Zbl.* 82 (82; 92), 1956 (1025–6; 1139–40). [G.]

A short account of the uses to which this wood is put in Germany, and of the often greatly differing views of German manufacturers as to its suitability for various purposes. Though it is freer from knots and other defects than German Oak, the latter is generally preferred. The need for publicity and research is stressed. The note by Bauer supplements and sometimes contradicts the information given by Kanzler.

811. Structure, Identification

See also No. 133.

854. JANE, F. W. **The structure of wood.** Adam & Charles Black Ltd., London. 1956. pp. vii + 427. 8 pp. of refs. Price £3.

Contains the following chapters: The names and classification of timbers (with a classified list of some of the more important plant genera that produce wood of economic importance); the histology of wood; the trunk of the living tree; the gross structure of wood; the histology of coniferous woods (softwoods); the histology of deciduous woods (hardwoods); some atypical trees and timbers; the ultimate structure of wood; the variability of wood, abnormal wood; diseased wood; figure in wood; the properties and uses of wood in relation to its structure; the identification of wood; the identification of some common timbers: (1) some common hardwoods; (2) some common softwoods; (3) those known commercially as Teak, Mahogany and Walnut; keys for the identification of wood; and specific differences in timbers (Oak, Elms, Ashes, Maples); with an appendix on technique for wood anatomy. There are more than 500 illustrations, many of them photomicrographs illustrating structural details.

855. BUDKEVIČ, E. V. Anatomičeskoe stroenie drevesiny vidov *Larix* v svjazi s ih sistematikoĭ. [**The anatomical structure of species of *Larix* in connexion with their systematics.**] *Bot. Ž.* 41 (1), 1956 (64–80). 33 refs. [Russ.russ.]

Describes the wood anatomy of 11 species on the basis of specimens at the Komarov Botanical Institute of the U.S.S.R. Academy of Sciences, with reference to Russian and other literature. Results are tabulated, and drawings of radial and tangential sections are given for some species. The most stable diagnostic character is found in the number of epithelial cells of the resin canals, by which two groups can be distinguished: (*a*) cells < 12—*L. dahurica*, *L. decidua*, *L. occidentalis*, *L. sibirica*, *L. sukaczewi*; and (*b*) cells (8–) 12–20—*L. kurilensis*, *L. laricina*. This grouping is based on adult wood, and no account is taken of *L. lyallii*, *L. potanini* and *L. olgensis*, of which only branchlets were available. In general, the wood structure is too uniform for specific identification. The microscopic characters are not always correlated with the morphological characters used to distinguish the sections of the genus. Smoothness of the ray tracheid walls and the common occurrence of biseriate tracheid pits are held to distinguish *Larix* from *Picea* in addition to differences in colour and distinctness of late wood.

856. SUDO, S. **Wood anatomical studies on the genus *Picea*.** *Bull. Tokyo Univ. For.* No. 49, 1955 (179–204 + 16 photos). 14 refs. [E.e.jap.]

Three types of spiral thickening in the vertical tracheids are described and are considered to be related to ring width and to the occurrence of crystals in the ray parenchyma. The occurrence of spirals in the ray tracheids was similar. The 18 species examined are divided by these characters into three groups which cut across Rehder's (*Eupicea*, *Casicta*, *Omorica*) but appear to correspond with a latitudinal zonation of species. The colour test based on reduction of flavone derivatives was found to be positive for *P. sitchensis* and *P. morrisonicola*, faint for 4 other species, and negative for the rest.

857. MANCERA VIGUERAS, O. Contribución al conocimiento de la anatomía microscópica de algunas especies de pinos mexicanos. [**The wood anatomy of some Mexican Pines.**] Instituto de Investigaciones Forestales, Secretaria de Agricultura y Ganadería, México. 1956. pp. 80. 12 refs. [Span.]

General characteristics and anatomy of the wood of 17 Mexican species of Pine.

858. BAILEY, I. W. **Nodal anatomy in retrospect.** *J. Arnold Arbor.* 37 (3), 1956 (269–87). 25 refs.

Summarizes 40 years' evidence supporting the contention (made in 1914–18) that ancestral angiosperms were relatively large perennials, the herbaceous habit in dicotyledons being derived rather than primitive, and that the structure of the xylem in Casuarinaceae, Betulaceae, and Fagaceae is not truly primitive but relatively highly specialized.

859. INGLE, H. D., and DADSWELL, H. E. **The anatomy of the timbers of the south-west Pacific area. IV. Cunoniaceae, Davidsoniacae and Eucryphiaceae.** *Repr.* from *Aust. J. Bot.* 4 (2), 1956 (125–51 + 5 plates). 13 refs.

The results reported cover 20 genera of the Cunoniaceae and the closely related monotypic families Davidsoniaceae and Eucryphiaceae. The anatomical features of the genera of these families are summarized. In the Cunoniaceae these results are compared with published information on the family and with features revealed by examination of the available species from other parts of the world. A grouping of the genera of the Cunoniaceae based on their wood anatomy is given for diagnostic purposes and for comparison with botanical grouping. [Cf. *F.A.* 15 No. 1732.] *From authors' summary.*

811.1. Anatomical Elements and Tissues.

See also Nos. 125–9, 878–9, 897, 908, 1061, 1120.

860. SEN, J. **Fine structure in degraded, ancient and buried wood, and other fossilized plant derivatives.** *Bot. Rev.* 22 (6), 1956 (343–74). 89 refs.

A review article on aspects of cell-wall structure, covering international literature, published for the most part since 1930.

861. MEIER, H., and YLLNER, S. Die Tertiärwand in Fichtenzellstoff-Tracheiden. [**The tertiary wall in Spruce-pulp tracheids.**] *Svensk PappTidn.* 59 (11), 1956 (395–401). 11 refs. [G.g.sw.e.] P.R.

Compares photomicrographs, using the phase-contrast microscope, of the tertiary wall of holocellulose, sulphite pulp (almost destroyed), and sulphate pulp (as well preserved as in holocellulose) and discusses the diffusion of cooking liquor through the cell walls. It seems probable that the tertiary wall consists mainly of xylan.

862. HARADA, H. [**Electron-microscopic investigation on the wart-like structure of conifer tracheids. II.**] *J. Jap. Wood Res. Soc.* 1 (2), 1955 (85–9). 7 refs. [Jap.e.] P.R.

[Cf. *F.A.* 15 No. 4017.] Electronographic investigations on Cr-shadowed or non-shadowed sections of early wood of *Cryptomeria japonica* and *Chamaecyparis obtusa* have shown that the wart-like structure was not the product of the replica-making technique, but an actual structure on the cell inner surface and on the surface of the pit borders of tracheids. The warts were found to be small mounds ca. 0·04–0·28 μ in diam. and ca. 0·02–0·20 μ high. The cell-wall layer of the wart-like structure was assumed to be the tertiary wall of conifer tracheids.

863. FREY-WYSSLING, A., BOSSHARD, H. H., and MÜHLETHALER, K. Die submikroskopische Entwicklung der Hoftüpfel. [**The submicroscopic development of bordered pits.**] *Planta* 47 (2), 1956 (115–26). 21 refs. [G.e.] O.B.D. [Cf. *F.A.* 16 No. 856.]

864. STEMSRUD, F. Über die Feinstruktur der Hoftüpfel-Schliesshaut von Nadelhölzern. [**Fine structure of the closing membrane of bordered pits in coniferous woods.**] *Holzforschung, Berlin* 10 (3), 1956 (69–75). 18 refs. [G.g.e.] P.R.

Electron microscopy shows that the torus of Spruce, Fir and Pine wood is not lenticular in cross-section, but consists of a flat disc formed by the middle lamella and the two primary walls, with a rim of secondary thickening round the margin. In the pit membrane the middle lamella appears to have been dissolved away, leaving gaps that, however, are of sub-microscopic size so that the membrane probably functions as a filter rather than as a sieve. A new type of torus was observed in the sapwood of Pines from Norway and Switzerland, characterized by perforations in the central, thin portion of the torus. This is held to be related to ease of penetration with preservatives.

865. SCARAMUZZI, G. **Variation of the volume proportions of wood elements within the stem in *Populus* × *euramericana* (Dode) Guinier cv. "I 214."** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/41/5 Rev., 1956. pp. 7 + 4 sets of gphs. [E.e.]

Material from a 10-year-old tree showed little variation in the volume % of fibres, vessels and rays, within the growth ring either radially or longitudinally or radially across the stem. [Cf. *F.A.* 17 No. 796.]

866. SAYA, I. Contribuzione alla conoscenza del tessuto legnoso di *Ailanthus glandulosa* Desf. [**The woody tissues of *A. altissima*.**] *Ann. Accad. ital. Sci. for.* 4, 1955 (315–44 + 6 photos). 12 refs. [It.f.]

A study was made of the wood of a 16-year-old *A. altissima* from ground level to a height of 2·20 m., with particular reference to the fibres and their possible interest for the pulp industry. Fibre length increased from the pith outwards and decreased from the base upwards; late-wood fibres were longer than early-wood fibres. Mean length of fibres was ca. 1 mm. Fibre diameter was more or less constant, so that the length/diameter ratio, which is of great importance in paper-making, depends chiefly on length. A correlation was found between the fibril angle and length of fibre. [Cf. *F.A.* 17 No. 3228.]

867. QUINTIN, S. Considérations évolutives à la suite de modifications histologiques provoquées chez les tiges d'*Araucaria excelsa* par l'acide indol-β-acetique et l'acide 2-4-dichlorophénoxyacétique. [**Evolutionary considerations in the light of histological modifications to twigs of *A. excelsa* caused by β-indolyl-acetic acid and 2,4-D.**] *Trav. Lab. for. Toulouse* 1 (5), Art. 26, 1955. pp. 17. 14 refs. [F.]

Describes in more detail the results of experiments with β-indolyl-acetic acid already reported [see *F.A.* 17 No. 794]. Similar results were obtained from treatment with 2,4-D.

868. BUGGENHOUDT, M. VAN. Bois. Contribution a l'étude des fibres gélatineuses. [**Wood: gelatinous fibres.**] Union Allumettière, Overboelare, Belgium. 1954. pp. 19 + 17 photos., 1 dgm. [F.] Limited circulation. P.R.

Includes a survey of literature on gelatinous fibres, with abstracts of ca. 10 original papers, followed by a report on the author's own observations on gelatinous fibres in Poplar. It is suggested that 'woolly' wood with gelatinous fibres in Poplars is the result of pruning.

811.2. Special Features and Abnormal Structure

See also No. 868.

869. ONAKA, F. **Studies on compression and tension wood.** *Transl. For. Prod. Lab. Can.* No. 93, 1956. pp. 99. 18 refs. Transl. from *Wood Res., Kyoto* No. 1, 1949. [See *F.A.* 11 No. 2815.] Limited distribution.

870. KLAUDITZ, W., and STOLLEY, I. **The biological-mechanical and technical properties of tension wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2785, 1955. pp. 9 + 6 photos., 2 gphs. Transl. by F. P. Just from *Holzforschung, Berlin* 9 (1), 1955 (5–10). [See *F.A.* 17 No. 3204.]

871. DYER, D. **Artificially induced tension wood in Ash, Birch and Poplar.** *J. Oxf. Univ. For. Soc. (Ser. 4)* No. 4, 1956 (19–23). 5 refs.

Two-year-old stems and branches of young trees of *Fraxinus excelsior*, *Betula alba*, and × *Populus eugenei* were used as experimental material. Tension wood developed on the upper sides of main stems and branches that were tied down, but on the lower sides of branches tied upwards. The rather upright branches of crowded Poplar plants had formed tension wood on their lower sides before the experiment began. The stress developed after tying, expressed as a % of the original pull, was about the same in all species and was lower in branches tied down than in branches tied up or in main stems. The tension wood of Ash, though less distinct, exerted as strong a pull as that of the other species.

872. WARDROP, A. B. **The nature of reaction wood. V. The distribution and formation of tension wood in some species of *Eucalyptus*.** *Repr.* from *Aust. J. Bot.* 4 (2), 1956 (152–66 + 3 plates). 25 refs.

The development of tension wood has been studied in various species of the genus *Eucalyptus* under a number of natural and experimental conditions. It is considered that the distribution of tension wood in the cases observed is consistent with the view that this tissue is an anatomical manifestation of various regulatory processes associated with the maintenance of tree form, and movements of orientation in response to environmental changes. Experiments were performed which demonstrated that the development of tension wood is associated with contraction in the stem or branches and that the resulting movements of orientation result from forces developed during differentiation of the fibres and not as a result of differential osmotic effects in the cambium. [Cf. *F.A.* 17 No. 1936.] *Author's summary.*

873. JUTTE, S. M. **Tension wood in Wane (*Ocotea rubra* Mez).** *Holzforschung, Berlin* 10 (2), 1956 (33–5 + 4 photos). 12 refs. [E.e.g.] P.R.

The results of investigations on the abnormal green wood of *O. rubra* favour a wider definition of tension wood than that currently in use. The author suggests the following definition: 'adult wood possessing fibres whose secondary wall has been built up, wholly or in part, out of one or more "gelatinous" or unlignified layers. These layers have no fixed place and their physical, anatomical and chemical properties differ from those of the normal cell wall'.

811.4. Growth Rings. Early and Late Wood

See No. 125.

811.5. Sapwood and Heartwood

874. SCARAMUZZI, F. Istologia del legno di pino d'Aleppo e sue modificazioni durante la duramificazione. [**The histology of the wood of *Pinus halepensis* and its modification during heartwood formation.**] *Ann. Accad. ital. Sci. for.* 4, 1955 (387–403 + 8 plates). 12 refs. [It.f.]

The author studied heartwood formation from increment cores taken at intervals over two years. It was found that the oleoresin content was in a state of equilibrium to a certain depth but that beyond the 25th–35th annual ring (at a depth varying with the width of the rings) the oleoresin spreads through the wood owing to the permeability of the cell wall caused by the death of the parenchyma cells. The death of these cells is preceded by a hypersecretion of oleoresin resulting in a heartwood rich in resin and without starch. The absence of a transition zone between heartwood and sapwood, and of all extractives except oleoresin, was confirmed.

811.6. Texture, Grain, Figure

See No. 1107.

811.7. Phloem. Bark

875. SCHWANKL, A. **Bark.** Thames and Hudson, London. 1956. pp. 100. Translated and edited by *H. L. Edlin.* Price 12*s.* 6*d.*

Includes a short general account of bark, descriptions and detail photographs of the bark of 75 tree and shrub species native or cultivated in Europe, and an account of the structure and uses of bark.

812. Physical and Mechanical Properties

See also Nos. 869–70, 1025.

876. BANKS, C. H. **The mechanical properties of the mature wood of *Pinus longifolia*, Roxb. grown in the Union of South Africa.** *J. S. Afr. For. Ass.* No. 26, 1955 (18–31). 10 refs.

Timber (1305 cu. ft. in all) from 4 stands, aged 27–36 years was examined. Air-dry density averaged 34 lb./cu. ft. with a very rapid increase from pith to bark and a general decrease up the bole, the density at 22 ft. corresponding closely to that

of the mean tree sampled, as in some other Pines. Mean growth rate was 5 rings/in. (range 3–7). Changes in ring width fluctuated independently of the steady radial density gradient, thus showing no influence on it. Weight and strength was intermediate between mature *Pinus pinaster* and *P. radiata* and very similar to that of coastal U.S. Douglas Fir. A table compares the properties of the species with 7 other Pines, Douglas Fir and Sitka Spruce.

877. KNUDSEN, M. V. **A comparative study of some technological properties of Norway Spruce in a provenance test.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/41/2, 1956. pp. 7 + 3 gphs. 12 refs. [E.]

Results of a study of 365 samples from 69 trees of 8 different provenances (Norway, Finland, Latvia, U.S.S.R., 3 from Germany, and Denmark) showed no marked differences between provenances in relationships between ring width, density, and bending strength, in volumetric shrinkage or in slope of grain. There were, however, considerable variations, presumably hereditary, between individuals; vegetative propagation of extreme types is proposed to confirm this.

878. FUKUYAMA, G., KAWASE, K., and SATONAKA, S. **[Moisture content, volume weight and fibre length of 'Sasa' [*S. kurilensis* var. *gigantea*].]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (271–93 + 8 photos). 19 refs. [Jap.jap.e.]

The moisture content of the current year's shoot was 60–70%, that of older growth 40–50%, with no appreciable effect due to site. The solid sp. gr. was 0·62–0·65, and sp. gr. including the hollow centre 0·42–0·54. Fibres averaged 1·28 mm. × 13·7 μ with greater lengths at the middle than at the butt and tips of stems, with branches showing a similar tendency. Fibre lengths were also greater on the outside of culms and were scarcely affected by size of material.

879. FERREIRINHA, M. P. Algumas relações entre as características anatómicas e físicas do lenho. **[Relationships between the anatomical and physical properties of wood.]** *Garcia de Orta, Lisboa* 4 (1), 1956 (57–70 + 4 plates). 17 refs. [Port.e.]

Studies on 63 tropical hardwoods from Angola, Mozambique, and Timor, gave the following results: (1) A positive correlation ($r = 0{\cdot}500$) between the volume of the rays (expressed in % of total volume) and the width of the rays expressed in number of cells, but no correlation between the volume and the number of rays per mm. (2) An insignificant correlation ($r = -0{\cdot}067$) between the density of the oven-dry wood and the ray volumes. (3) The correlation between ray volume and T/R (tangential/radial shrinkage) was not significant ($r = 0{\cdot}245$), but the ratio T/R tended to be higher when abundant metatracheal or banded vertical parenchyma was present, and lower in species with little or no parenchyma. (4) In oven-dry specimens a significant negative correlation between mean fibre width and density ($r = -0{\cdot}598$) and between mean fibre length and density ($r = -0{\cdot}413$), for which equations are presented. (5) A positive and significant correlation between density and volumetric shrinkage ($r = 0{\cdot}528$). (6) A significant negative correlation between mean fibre width and volumetric shrinkage ($r = -0{\cdot}436$). Studies on transverse sections of *Pinus pinaster* showed that radial shrinkage (R) was greater in late wood than in early wood. R and tangential shrinkage (T) in late-wood tracheids were the same (ca. 12%), whereas T in early-wood tracheids was ca. 16% and R was nil. [Cf. *F.A.* 15 No. 4059.] *From author's summary.*

880. GARCIA, R. R., and GARCIA, J. J. M. Estudio físico y mecánico de las especies forestales del género *Piptadenia.* **[The physical and mechanical properties of *Piptadenia* spp.]** *An. Adm. nac. Bosques, B. Aires* 1956 (63–84). [Span.]

The study showed that *P. macrocarpa*, *P. rigida* and *P. excelsa* are highly suitable for structural uses, though account must be taken of high shrinkage values and consequent lack of stability. Data from laboratory tests are presented. It is suggested that trees should be felled at the beginning of winter so as to avoid quick drying and, after preliminary conversion, the transversely cut ends should be painted before seasoning, which must be slow. Since radial-shrinkage values are about half those for tangential shrinkage, quarter-sawing is advisable before drying. Recommendations are made for stacking for air seasoning. All are hard woods, but *P. rigida* is the most difficult to saw and is therefore excluded from certain carpentry and joinery purposes. Specific uses for all the timbers are suggested.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 912–4, 916, 975, 977, 993.

881. NARAYANAMURTI, D. **Sound and heat insulating materials of indigenous origin.** *Bulletin, National Institute of Sciences of India, New Delhi* No. 6, 1955 (183–201). 43 refs. P.O.

The thermal conductivity of 56 species of Indian timbers and of various insulation boards made from indigenous materials is recorded. Data are included on the sound absorption coefficients for various indigenous materials.

882. PENTONEY, R. E. **Effect of moisture content and grain angle on the internal friction of wood.** *Comp. Wood* 2 (6), 1955 (131–6). 11 refs. P.R.

Measurements of internal friction in flexure were made, in both the restrained-free (cantilever) and the free-free end conditions, for *Tilia americana*, *Gleditsia triacanthos*, *Quercus rubra*, *Thuja plicata*, *Pinus strobus* and *Pseudotsuga taxifolia.* The internal friction was essentially independent of frequency from 10 to 1000 cycles/sec., and thereafter increased with frequency in specimens cut ||. In general, it increased with moisture content (m.c.) for all grain angles and species, the degree of change being, however, highly dependent on the grain angle, frequency used and the reference m.c. It was confirmed that internal friction is highest when measured ⊥. A modified Hankinson's equation is suggested for representing the variation, at a given

frequency and m.c., of internal friction with grain angle.

883. VORREITER, L. Abbrandverlust und Temperaturdämmung von Holz und Holzwerkstoffen. **[Weight loss in burning and temperature damping of wood and composite materials made from woody matter.]** *Holzforschung, Berlin* 10 (3), 1956 (75–80). 12 refs. [G.g.e.] P.R.

A survey of the different methods proposed for the calculation of inflammability and weight losses in burning is followed by a discussion of the author's improved methods for evaluating the specific surface-burning rate and the specific burning rate (in terms of weight); also discusses the notion and calculation of the mass residue, the depth of burning, and temperature conductivity, using new equations for the insulation value. The variation of the temperature conductivity of burning Spruce wood is represented as a function of the duration of combustion.

884. HEARMON, R. F. S., and BURCHAM, J. N. **The specific heat and heat of wetting of wood.** *Chem. & Ind.* 1956 (31), (807–8). 14 refs. P.R.

The validity of Kirchhoff's thermochemical equation as applied to the specific heat of wood, viz. $(-dw/dT)/1 + u = c_o - c_u = \Delta c$, where w is the heat evolved in wetting the material from dryness to a moisture content u, c_o is the specific heat of the dry material, and c_u that of the material with m.c. u, has been proved with sufficient certainty by the results of measurements of the heat of wetting and specific heat of sawdust at different T and u values. [Cf. *F.A.* 17 No. 1950.]

885. KELSEY, K. E., and CLARKE, L. N. **The heat of sorption of water by wood.** *Aust. J. appl. Sci.* 7 (2), 1956 (160–75). 22 refs. P.R.

Integral and differential heats of sorption were calculated from measurements of the heat of wetting of the ground wood of *Araucaria klinkii*. It was found that the dependence of the differential heat of sorption on relative vapour pressure for wood is similar to that reported by other investigators for cotton and other forms of cellulose. The integral heat of sorption depends on temperature at all moisture contents > ca. 0·12 g./g., the heat evolved on sorption decreasing as temperature increases. The heat of sorption appears to be independent of temperature at low moisture contents. It was shown that, as a result of the variation in the heat of sorption with temperature, the specific heat of the wood/water aggregate should be greater than that calculated from the specific heats of the pure components using the simple-mixture relation. *From authors' summary.*

886. CHANMAMEDOW [HANMAMEDOV], K. M. **[Electrical resistance of wood.]** *Doklady Akademii Nauk Azerbaĭdžanskoĭ SSR* 11, 1955 (415–9). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 10 (3), 1956 (89). [G.] P.R.

Test pieces 0·3 cm. thick of Ash, Pine, Beech and Oak were tested for electric breakdown. Oven-dry wood showed in the longitudinal direction a breakdown-voltage value of 17–19 KV/cm., and in the radial and tangential directions, 68–88 KV/cm. A moisture content of 10% caused slightly lower values, whereas at 22% m.c. Beech showed a breakdown voltage of only 6 KV/cm. in the radial and tangential directions. The breakdown voltage increases when wood is impregnated with oily preservatives or compressed.

887. TRAPP, W., and PUNGS, L. Bestimmung der dielektrischen Werte von Cellulose, Glukose und der Zellsubstanz von Naturholz im grossen Frequenzbereich. **[Determination of dielectric values of cellulose, glucose and cell substance of native wood over a wide frequency range.]** *Holzforschung, Berlin* 10 (3), 1956 (65–8). 9 refs. [G.g.e.] P.R.

[Cf. *F.A.* 16 No. 3362.] The permittivities of wood fibres and cellulose *in vacuo* are presented in a table and graphs and discussed.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 877–80, 884–5, 907, 915, 1011–2, 1095–6, 1109.

888. RICHARDSON, R. H. **Moisture meters for timber.** *Aust. Timb. J.* 22 (6), 1956 (591 . . 596, 668 . . . 687).

A general review of methods is followed by particulars of instruments and their various models (name, manufacturer, British agent, description, merits, and whether tested by the author). They include the following types: electrical resistance (6), radio-frequency capacity (3), relative humidity (2), continuous reading (5). Some of the last are designed for paper or textiles, but could be adapted, particularly for veneers and plywood, for automatic monitoring.

889. UYEMURA, T. **[The effects of thickness of wood materials on electrical moisture meter readings.]** *J. Jap Wood Res. Soc.* 2 (1), 1956 (49–52). 6 refs. [Jap. e.] P.R.

The effect of thickness of thin wood materials (boards, plywood and veneer) on the readings of moisture meters, is quite considerable both in the HF and resistance-type meters. Measurements in such material with electrical moisture meters should therefore be performed with the utmost care, due consideration being given to the thickness of specimen and characteristics of the supporting table.

890. GONET, B. Analiza wzorów na nasiąkliwość drewna. **[Analysis of formulae for the maximum water content of wood.]** *Sylwan* 100*A* (3), 1956 (52–9). 4 refs. [Pol.russ.g.]

Analyses Kollmann's and Madison formulae and gives a table of oven-dry density and corresponding total-shrinkage values, for which both formulae give almost identical results.

891. SCHNIEWIND, A. P. **Sorption hysteresis in relation to wood thickness.** *For. Prod. J.* 6 (6), 1956 (225–9). 9 refs.

Experiments in which pieces of *Populus grandidentata* wood, 3 × 2 in. and varying in thickness from 0·05 to 0·8 in., were brought to equilibrium

moisture content (e.m.c.) at varying relative humidities and constant temperatures, either by desorption from the green, or adsorption from the oven-dry condition, showed no significant influence of thickness on the difference in e.m.c. obtained by the two methods.

892. **The moisture content of timber in use.** *Leafl. For. Prod. Res., Lond.* No. 9 (rev.) 1956. pp. 3.

Contains a chart showing the moisture contents that have been determined in a number of environments. The headings cover many uses of timber. A scale of shrinkages is given at the side of the graph.

893. Tsoumis, G. T. Hē hygrasia tou xylou hypo tas klimatikas synthēkas tēs Hellados. [**Moisture content of wood under the climatic conditions of Greece.**] *Repr.* from *Technica Chronica* [*Athens*] No. 371/372, 1955 (3–8). 17 refs. [Gk.e.]

The equilibrium m.c. (e.m.c.) for wood in sheltered, outdoor positions at 21 places in Greece, representative of its climatic range, are tabulated for each month of the year, the e.m.c. values being determined from the Loughborough-Keylwerth curves for Sitka Spruce on the basis of the mean monthly temperature and relative humidity; the triple relationship is shown graphically for Salonica. Extreme values are 7·8% (July, Athens) and 23% (December, Mt. Parnes); indoor values are estimated to vary between 6 and 12%.

894. Kelsey, K. E., and Steele, R. L. **Project T.P.22. Shrinkage and density determinations. Progress report No. 2. Shrinkage and density of plantation grown *Pinus radiata*.** Division of Forest Products, C.S.I.R.O., Melbourne. 1956. pp. 8 + 24 gphs., 5 tbls. 4 refs. P.R.

The sapwood of the 30- and 40-year-old trees was denser (both green and dry) than that of 10- and 20-year-old trees, and its transverse shrinkage was also greater. The m.c. of green sapwood decreased with increasing age. The density increased significantly with increasing distance from the pith.

895. Kitamura, H. [**Studies on the shrinkage of important timbers: I. *Abies firma* from Gunma prefecture. II. *Tsuga sieboldii* from Gunma prefecture.** *J. Jap. Wood Res. Soc.* 2 (1; 2), 1956 (13–8; 55–9). 4 refs. [Jap.jap.e.] P.R.

For both species, the formula $S = T/(a + bT)$, where S = shrinkage (%), T = time, and a and b are constants (applicable over the range of ca. 1–6 hours after the start of drying), was found to be applicable to tangential, radial and longitudinal shrinkage of heartwood and sapwood dried at 42° C. and 0% relative humidity (r.h.) from the state in equilibrium with 100% r.h. The relationship between S (%) and moisture content u (%) was $S = ae^{bu}$ for tangential and radial shrinkage, and $S = a + bu$ (applicability range ca. 5–17% m.c.) for longitudinal shrinkage. Data are included on initial m.c., green and oven-dry densities, and shrinkage ratios (tangential/radial and tangential/longitudinal).

896. Okusa, K., and Hayashi, S. [**Shrinking and swelling of wood under stress. I. Compressive stress.**] *J. Jap. Wood Res. Soc.* 2 (1), 1956 (5–7). 10 refs. [Jap.e.] P.R.

The authors' experiments show that wood under compression shrinks more and swells less than in stress-free conditions, even when the stress is far below the elastic limit.

897. Ławniczak, M., Nowak, K., and Dregier, W. Badania nad pęcznieniem mikroskopowych preparatów drewna. [**Studies on the swelling of microscopic sections of wood.**] *Sylwan* 100*A* (3), 1956 (89–96). 10 refs. [Pol.]

Microscopic sections (area ca. 4 sq. cm., thickness 0·1 mm., cut after first soaking in methanol) and 2 × 2 × 2 cm. blocks of Scots Pine sapwood (*A*) and heartwood (*B*), Oak heartwood (*C*), Beech (*D*) and Poplar (*E*), cut with growth rings parallel to one edge of the test-piece, were measured when oven-dry and when waterlogged. The sections swelled more than the blocks, the difference being particularly great in the radial direction for (*C*) and (*D*). It seems that one of the factors inhibiting radial swelling is the presence of rays. The tangential/radial swelling ratio was greater in blocks than in sections.

898. Moskaleva, V. E. **Swelling of microsections of natural and compressed Pine wood in liquids of different polarities.** *Transl. For. Prod. Lab. Can.* No. 98, 1956. pp. 6. 4 refs. Transl. from *Trud. Inst. Les.* 9, 1953 (121–6). [See *F.A.* 15 No. 4046.] Limited distribution.

899. Bazhenov [Baženov], V. A. **The water permeability of wood.** *Transl. For. Prod. Lab. Can.* No. 99, 1956. pp. 18. 5 refs. Transl. from *Trud. Inst. Les.* 9, 1953 (186–204). [See *F.A.* 15 No. 4052.] Limited distribution.

900. Stone, J. E. **The penetrability of wood.** *Pulp Paper Mag. Can.* 57 (7), 1956 (139–45). 6 refs.

With 2 air-flow meters in series, the restriction in one being the capillaries (w) in an oven-dry wood dowel and in the other a glass capillary (g) of known dimensions, the Poiseuille equation gives $r_w^4 = r_g^4/(N \times A) \times P_g/P_w \times l_w/l_g = \text{Constant} \times P_g/P_w$, where r and l = radius and length of capillary, P = pressure drop, N = number of capillaries per unit cross-section of wood, and A = its cross-sectional area. The only unknowns are r_w (average radius of wood capillaries) and N. To obtain the penetration factor (p.f.), all the capillaries in 1 sq. cm. of wood are considered to be united in a single capillary ($N = 1$) giving the same rate of flow. The radius of this hypothetical capillary is r_w and the p.f. is the fourth power of this radius. Tables show the variation of this p.f. for the sap- and heartwood within a single log and within a species for *Populus tremuloides*, *Betula papyrifera*, *Fagus grandifolia* and *Acer rubrum*, and between species, including 8 conifers and 17 hardwoods from N. America. In the same table is a comparison of normal *P. tremula* with the triploid form, both from Finland. The very much greater heartwood p.f. of the latter is ascribed to the absence of tyloses, a major obstacle to penetration. The practical implications of the p.f. are indicated e.g. the way in which wood may be expected to take up pulping liquor; with a p.f. of 1×10^{-10} this would be exceedingly difficult under any practical treatment; below 50×10^{-10} difficult;

50–500 $\times$ 10^{-10} successful under appropriate conditions, above 500 $\times$ 10^{-10} minimum difficulty.

901. **Moisture movement and distribution in wood.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (48–9).

Douglas Fir discs, 1 in. thick, waterlogged (*a*) and air-dry (*b*), were exposed on one side to dry air (dried with P_2O_5) and kept in contact with water on the other. As soon as the state of steady moisture movement had been reached, the discs were cut up. Although the fall in moisture content (m.c.) with distance was very sharp in both series, the m.c. at a given distance from the wet face was always higher in (*a*) than in (*b*). The experiments are now being repeated with Beech.

902. **Permeability of timber.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (30–1).

Measurements of the longitudinal permeability to air showed that broadleaved species have a permeability range of from 5 million to 1, and coniferous ca. 500,000 to 1. Among broadleaved species, the highest permeability primarily depends on the size and number of pores; in the medium and low range, however, permeability is determined by the extent of pore blockage (e.g. tyloses and gum deposits). It appears that, in general, all permeable woods are perishable, and impermeable ones durable; but this does not hold for conifers.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 876–80, 894, 907, 909–10, 915, 1011, 1115.

903. ZOBEL, B., and RHODES, R. **Specific gravity estimations of mature Loblolly Pine from juvenile wood and seedling limb sections.** *For. Sci.* 2 (2), 1956 (107–12). 14 refs.

High correlations ($r = 0{\cdot}805$–$0{\cdot}856$) were found in 2 groups of mature trees between the sp. gr. of the generally lighter wood of the first 8 years' growth and the sp. gr. of the whole radial core. Correlations were also tested between the sp. gr. of 6-in. sections of the distal and proximal wood of branches of 3-, 6- and 9-ft. trees and that of the 6-in. section adjacent, above and below the branch insertion. The best correlation was in the branch-wood nearest the stem in the 6-ft. tree ($r = 0{\cdot}692$). The stemwood in these cases is not strictly comparable to the wood of the first 8 years in the mature tree, and further work on this and on other likely correlations is needed to accelerate research in tree breeding by providing early estimates of the results of hybridization without destroying the tree.

904. GÖHRE, K. Einfluss von Wuchsgebiet, Standort, Rasse und Bewirtschaftung auf die Rohwichte des Holzes. **[The influence of growth region, site, race and tending on the specific gravity of wood.]** *Arch. Forstw.* 4 (5/6), 1955 (414–33). 15 refs. [G.g.]

Data are examined statistically to show that the range of sp. gr. in trees from a single site is so great that differences between growth regions (Douglas Fir in America and Germany), sites (Douglas Fir, Spruce and Scots Pine), races (Scots Pine), treatments (thinning for Spruce; thinning and fertilizing for Scots Pine) and tree class (Scots Pine) are not significant. [Cf. *F.A.* 15 No. 2833.]

905. GÖHRE, K. Die Rohwichte des Douglasienholzes, ihre Verteilung im Stamm und Abhängigkeit vom Abstand vom Mark, Jahrringbreite und Spätholzanteil. **[The density of Douglas Fir stem timber as affected by distance from pith, ring width, and the proportion of late wood.]** *Arch. Forstw.* 4 (5/6), 1955 (639–61). 18 refs. [G.g.]

A detailed examination of the variation in oven-dry density throughout the stem, with numerous graphs and detailed statistical support, based on $>$ 2000 samples from ten 60- to 70-year trees from 5 sites in Germany. The procedure of sampling by cutting pieces of 2 $\times$ 2 $\times$ 3 cm. from along the N.-S. and E.-W. diameters is claimed to be justified on statistical grounds. Correlation analyses suggest that distance from the pith, ring width and % of late wood affect density in the proportions of 45, 32 and 25% respectively.

906. **Specific gravity-strength relations for wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1303 (rev.) 1956. pp. 4 + 2 gphs. P.R.

A revision of the 1941 report. A table gives minimum oven-dry density values for aircraft woods. Two graphs illustrate the relation between bending strength (modulus of rupture) and density for 115 hardwoods and 48 softwoods.

812.7. Strength Properties

See also Nos. 876–7, 880, 906, 941, 960–5, 1011–2, 1027, 1109, 1115, 1119.

907. RANDALL, C. A. **Strength and related properties of Tanoak.** *J. For.* 54 (7), 1956 (458–62). 5 refs.

Gives results of standard destructive tests on 300 clear specimens of *Lithocarpus densiflorus*, showing that its strength and related properties (tabulated) are similar to those of Oaks. Oregon has 1700 million bd. ft. of sawtimber of this species, uses for which are suggested. [Cf. *F.A.* 17 No. 3215.]

908. PECHMANN, H. VON. Über den Zusamt menhang zwischen der Struktur und der Festigkeibei einigen Laubhölzern. **[The relationship between structure and strength of some hardwoods.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO*/56/41/3, 1956. pp. 4 + 2 photos, 3 gphs. [G.]

The following relationships were found: (1) *Sessile Oak*—Trees grown in a dense stand, with tall slender stems and poorly developed crowns, had a high proportion of fibres (up to 60%) while those grown in the open, with well developed crowns, had comparatively few fibres (20–30%) but a high proportion of tracheids (generally over 30%). Tests on Oaks from the Spessart showed a close direct relationship between the % of fibres and compressive strength. (2) *Ash*—Tests on trees from several forest districts in S.W. Germany showed that impact bending strength was generally higher in trees with thick-walled than in those with thin-walled fibres, and that the latter generally came from dense stands and had poorly developed crowns. (3)

Beech—Properties of Beech were generally related to thickness of the fibre walls. Several trees with thick-walled fibres, however, had comparatively poor strength; staining showed that variations in strength of a number of samples with the same fibre-wall thickness were related to the degree of lignification.

909. CURRÒ, P. **Compression strength and static center loading with respect to their specific gravity in *Eucalyptus botryoides*.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/41/7, 1956. pp. 5 + 5 gphs. 1 ref. [E.]

Both factors were found from samples from 3 trees to increase with specific gravity. Equations are derived from the results, and experimental and calculated values are shown in graphs.

910. GIORDANO, G., and CURRÒ, P. **Compression strength in the wood of three Poplar stems with respect to their specific gravity.** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/41/6 Rev., 1956. pp. 10 + 5 gphs. 2 refs. [E.]

For all three Poplars (two trees of × *P. euramericana* 'I 214', one each from Alessandria and Pisa, and one tree of *P. tremula* from Cosenza) compression strength increased with sp. gr. Graphs show experimental and calculated results.

911. **Effect of depth on the strength properties of timber beams.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (20).

Results of tests with a series of [miniature] beams 2 cm. in width and ½–8 cm. in depth showed that any effect of depth occurs mainly when the material is stressed beyond the limit of proportionality.

912. **Elastic and allied properties of wood.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (49–51).

In the determination of the modulus of elasticity of wood from the bending vibrations of beams that are not excessively long in relation to their cross dimensions, there occur departures from the simple theory, due to some shear effect. These departures were studied at Princes Risborough. In a Beech specimen, 83 × 5 × 2·5 cm., using modes of vibration up to the 10th mode, the observed fundamental frequency was 3% lower than that calculated from simple bending theory. The effect of frequency on the damping in lower modes could not be established unambiguously. Differences in moduli of elasticity or damping obtained by the vibration method, between sound and recently fungus-attacked Beech specimens, were found not to be significant.

913. KOHARA, J., and OKAMOTO, H. **[Studies on the permanence of wood. XVII. Increase of Young's modulus of bending by heat treatment.]** *J. Jap. Wood Res. Soc.* 1 (2), 1955 (80–4). 3 refs. [Jap.e.] P.R.

Specimens of *Chamaecyparis obtusa*, 14 × 14 × 450 mm., were heated to 130° C. for periods of 3–120 hours, after which their elasticity was determined by Ewing's method (span 440 mm., load 200–1200 g.). The relation between the modulus of elasticity in bending (y) and the time of heat treatment (t) is tentatively expressed by the formula $y = y_o - At + B\ (1 - e^{kt})$. The values of the constants y_o, A, B and k are given in a table and compared with those for old timbers. [Cf. *F.A.* 15 Nos. 707, 4115.]

914. KITAHARA, K., and SUEMATSU, A. **[Influence of temperature on the compressive properties of wood.]** *J. Jap. Wood Res. Soc.* 1 (2), 1955 (47–51). 5 refs. [Jap.jap.e.] P.R.

Air-dry and oven-dry wood of *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Fagus crenata* and Red Lauan [*Shorea negrosensis*?] were subjected to compression ∥ and ⊥ at different temperatures. For each species and both degrees of dryness, the compressive strength ∥ decreased almost linearly with rise in temperature, the stress at limit of proportionality and Young's modulus ⊥ also decreasing. No significant differences in this temperature effect were observed between oven-dry and air-dry wood.

915. OKOHIRA, Y. **[Studies on the compression perpendicular to the grain and radial to the growth increment [annual rings] in the wood of Sugi, *Cryptomeria japonica*.]** *J. Jap. Wood Res. Soc.* 1 (2), 1955 (52–4). 6 refs. [Jap.e.] P.R.

No significant correlation was found between compressive strength and density within the density range 0·32–0·39 g./c.c. For m.c. values below fibre-saturation point, the following relationship was established between the compressive strength (σ in kg./sq. cm.) and moisture content (u in %): $\sigma = 58{\cdot}01 \times 10^{0{\cdot}01209u}$.

916. MAMADA, S. **[Hardness test of wood by a pendulous friction apparatus.]** *Bull. Tokyo Univ. For.* No. 49, 1955 (205–16). 12 refs. [Jap.e.]

The apparatus (illustrated), of Japanese design, consists of a pendulum arm having a direct length of 37 cm., and a frequency of vibration (m) of 48/min. The top of the arm is bent in a hoop to allow an unobstructed swing when the fulcrum is perched on a wood surface. The fulcrum consists of 2 steel balls set in the base of the 2 vertical legs in which the hoop terminates. Below the bob a pointer travels over a mm. amplitude scale. The damping of its vibrations is proportional to the pendulum's velocity and is almost entirely ascribable to the friction between the steel balls as they rock with the pendulum and the wood surface. The damping ratio ν is equal to the amplitude of the first vibration (y_1) divided by that of the second (y_2) and so on

$$\frac{y_n}{y_{n+1}}.$$

Amplitudes were measured at 1-min. intervals (N) and $y_N = y_1\, \nu^{-m(N-1)}$. Linear relations are shown between the logarithm of amplitude ($\log_{10} y$) and the time (N), and from the gradients of these lines a table of ν for 8 Japanese species is derived. The effects of different pendulum weights (0·4, 1·2 and 2·0 kg.), diameter of steel ball (0·5, 1·0, 2·0 cm.) and surface (planed and sawn) are graphed. The dimensions 2·0 kg. and 0·5 cm. are generally used. The

following equations are developed:

$v = 1{\cdot}059 - 0{\cdot}0119\,G$, where G = sp. gr., and
$v = 1{\cdot}014 - 28 \times 10^{-4} H_b$ where H_b = Brinell hardness (kg./cu. mm.). The effect of moisture content is also examined.

917. MIYAJIMA, H. **The hardness test by static ball indentation for wood, especially for Nara wood [*Quercus crispula*], under various moisture conditions.** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (749–68). 10 refs. [E.e.jap.]

[Cf. *F.A.* 14 No. 1511.] It is confirmed that the relation between load and depth of indentation within a certain range of indentation is approximately linear and that the Brinell hardness number is constant for any load within that range. This was true for Nara regardless of surface and moisture content. Tests of (*a*) green, (*b*) air-dry, and (*c*) oven-dry samples of this species showed that for all three, end hardness was greatest when ring width was 2·0–2·2 mm., decreasing parabolically with wider and narrower rings, and specific gravity and Brinell hardness number had a linear relation. The ratio of hardness of (*a*), (*b*) and (*c*) is as 0·5 : 1 : 2; radial hardness is 30–40% of end hardness and the tangential ca. 120–130% of the radial.

918. SANDERMANN, W., and SCHWARZ, E. Über die Schnellbestimmung der 'Härte' von Hölzern mit dem Schaukelhärteprüfer. **[Rapid determination of the hardness of woods by means of the rocking hardness tester.]** *Holzforschung, Berlin* 10 (2), 1956 (48–50). 17 refs. [G.e.] P.R.

Zeidler and Herzog's rocking hardness tester, ordinarily used for testing lacquers and varnishes, is shown to be eminently suited for a rapid and reliable determination of the hardness of wood, provided that the rocking of the instrument occurs at right angles to the grain.

919. HOHLOV, K. K. O metodah ispytanija drevesiny na skalyvanie vdolj volokon. **[Methods of testing wood for shear along the grain.]** *Derev. Prom.* 4 (11), 1955 (18–9). [Russ.russ.] P.R.

The method of Soviet Standard GOST 6336–52 is liable to give strength values with an error of up to 15–20%. Modifications of the test apparatus are suggested to give more accurate results.

813. Wood Chemistry

See also Nos. 199, 1121, 1125 *et seq*

920. FUKUYAMA, G., KAWASE, K., and SATONAKA, S. **[Chemical composition of wood of *Sasa* sp.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (295–320). 27 refs. [Jap.jap.e.*e.*]

Tables give the % composition (C, H, ash, pentosans, cellulose, lignin) and the solubility in various solvents, mineral composition, a comparison with Beech [*Fagus crenata*?] when both are treated with various concentrations of HCl, and the composition after treatment with various concentrations of NaOH. [Cf. *F.A.* 17 No. 3434.]

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 126, 861, 869–70, 1059–61.

921. FREUDENBERG, K. Lignin im Rahmen der polymeren Naturstoffe. **[Lignin among the natural polymeric substances.]** *Angew. Chem.* 68 (3), 1956 (84–92). 30 refs. [G.] D.S.I.R.

The author has studied the following natural polymeric substances: cellulose, starch, tannins and lignin. The structure of these substances becomes more and more complex as one passes from cellulose to lignin. The work on lignin is surveyed in more detail.

922. TRAYNARD, P., and EYMERY, A. Délignification par les solutions hydrotropiques. II. Étude des lignines hydrotropiques. III. Lignines hydrotropiques et taxonomie des végétaux dont elles ont été extraites. **[Delignification by means of hydrotropic solutions. II. Investigation of hydrotropic lignins. III. Hydrotropic lignins and the taxonomy of the plants from which they have been extracted.]** *Holzforschung, Berlin* 10 (1; 2), 1956 (6–11; 43–5). 12 refs. [F.f.g.] P.R.

(II) A thorough chemical analysis of a hydrotropic lignin from Poplar wood seems to indicate that it is a homogeneous preparation. The hypothesis is advanced that a diketone is present in its formula [cf. *F.A.* 17 No. 3245].

(III) Various chemical characteristics of hydrotropic lignins from Poplar, straw, Silver Fir, Ginkgo and Ephedra have been determined, and an attempt is made to relate these characteristics and taxonomy. Some significant differences appear to exist between gymnosperms and angiosperms.

923. MIGITA, N., NAKANO, J., and ISHIZU, A. **[Studies on lignin. XXIV. On the chlorination of lignin.]** *J. Jap. Wood Res. Soc.* 1 (2), 1955 (55–9). 8 refs. [Jap.e.] P.R.

[Cf. *F.A.* 15 No. 2851.] The authors devised a method for determining Cl in the nuclear part of chlorinated lignin separately from Cl in the side chain. This method, when applied to Beech and Spruce wood-flour, showed that (1) mild chlorination introduced most of the Cl into the nuclei of lignin molecules, (2) strong chlorination increased both the total proportion of bound Cl and the relative amount of Cl in the side chain.

924. SADOH, T., and KADITA, S. **[Studies on the relations between physical properties and chemical constituents of wood. I. Determination of the crystallinity and accessibility of polysaccharides in wood.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (73–5). 9 refs. [Jap.e.] P.R.

The range of accuracy in determining the crystallinity of polysaccharides in wood was found to be ca. 3% [i.e. $\pm 1{\cdot}5\%$] for the two methods used—direct hydrolysis of the wood sample and hydrolysis of holocellulose. Results obtained by both methods for 7 wood species (3 broadleaved, 1 tropical broadleaved and 3 conifers) agreed within $\pm 2\%$. The accessibility was greater in broadleaved than in coniferous woods, but the one tropical broadleaved species showed least accessibility. It was also found

that the crystallized region of polysaccharides in wood consisted almost exclusively of hexosans, while pentosans played an important part in the accessible region.

925. ANTHIS, A. **Some carbohydrate linkages in Slash-Pine alpha-cellulose.** *Tappi* 39 (6), 1956 (401–5). 20 refs. P.R.

Chromatographic separation of several disaccharides obtained from this cellulose by mild treatment showed that glucose and mannose units were linked together in the α-cellulose.

926. HAMILTON, J. K., KIRCHER, H. W., and THOMPSON, N. S. **The nature of the hemicelluloses associated with wood cellulose from Western Hemlock (*Tsuga heterophylla*).** *J. Amer. chem. Soc.* 78 (11), 1956 (2508–14). 35 refs. O.R.S.

927. DUTTON, G. G. S., and SMITH, F. **The constitution of the hemicellulose of Western Hemlock (*Tsuga heterophylla*). I. Determination of composition and identification of 2-*O*-(4-*O*-methyl-*D*-glucopyranosiduronic acid)-*D*-xylose. II. Hydrolysis of the methylated hemicellulose.** *J. Amer. chem. Soc.* 78 (11; 15), 1956 (2505–7; 3744–8). 47 refs. O.R.S.

928. MILKS, J. E., and PURVES, C. B. **Attempted preparation of a homogeneous hemicellulose from Aspen wood.** *J. Amer. chem. Soc.* 78 (15), 1956 (3738–44). 33 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 1108, 1138.

929. ERDTMAN, H. **The chemistry of heartwood constituents of conifers and their taxonomic importance.** *Experientia, Basle* Suppl. 2, 1955 (156–80). [E.] O.R.S.

A survey of research in this field at the Royal Institute of Technology, Stockholm.

930. **Symposium of recent advances in the chemistry of naturally occurring pyrones and related compounds.** *Sci. Proc. R. Dublin Soc.* 27 (6), 1956 (75–192). O.R.S.

Includes the following papers: The occurrence of chalkones and flavanones in plant products (*T. R. Seshadri*); the constitution and synthesis of leucoanthocyanidins (*F. E. King*); some naturally occurring γ-pyrone derivatives [e.g. from Ponderosa Pine bark and *Artocarpus integrifolius*] (*N. V. Bringi et al.*); and flavonoid heartwood constituents of conifers (*H. Erdtman*) [cf. preceding abstract].

931. ZAVARIN, E., and ANDERSON, A. B. **Paper chromatography of the tropolones of Cupressaceae.** *Repr.* from *Journal of Organic Chemistry, Baltimore* 21, 1956 (332–5). 11 refs.

A chromatographic procedure has been developed for separation and identification of the known tropolonic constituents of Cupressaceae heartwood extractives. Heartwoods of 8 species have been analysed and the results are tabulated and discussed.

932. KENNEDY, R. W., and WILSON, J. W. **Variation in taxifolin content of a Douglas Fir stem exhibiting target ring.** *For. Prod. J.* 6 (6), 1956 (230–1). 10 refs.

The amount of taxifolin (dihydroquercetin), an extractive with fungicidal properties, increased with radial distance of specimens from the pith for normal dark heartwood, but the light-coloured zones of 'included sapwood' characteristic of the 'target ring' pattern contained smaller, fairly constant %s, thus being more susceptible to decay.

933. HILLIS, W. E. **Leucoanthocyanins as the possible precursors of extractives in woody tissues.** *Repr.* from *Aust. J. biol. Sci.* 9 (2), 1956 (263–80). 49 refs.

Discusses results of a study on the distribution of leucoanthocyanins in tissues of *Eucalyptus* spp.

934. COX, J. S. G., KING, F. E., and KING, T. J. **The chemistry of extractives from hardwoods. Part XXVI. Experiments on *cyclo*eucalenol, a new triterpene from *Eucalyptus microcorys*.** *J. chem. Soc.* June, 1956 (1384–92). 15 refs. O.R.S.

935. GUPTA, V. N., and SESHADRI, T. R. **Special chemical components of commercial woods and related materials: Part III—*Pterocarpus indicus*.** *J. sci. industr. Res., India* 15*B* (3), 1956 (146–9). 7 refs.

[Cf. *F.A.* 15 No. 4109.] Samples of this wood from Malaya and the Philippines do not contain pterocarpin, homopterocarpin, pterostilbene or any isoflavone derivatives, but only angolensin in the *laevo* form.

936. **Wood extractives.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (43–4).

Preliminary results are given of investigations on the extractives of Indian Rosewood [*Dalbergia latifolia*] and *Morus lactea*.

937. DAVE, K. G., and VENKATARAMAN, K. **The colouring matters of the wood of *Artocarpus integrifolia*: Part I—Artocarpin.** *J. sci. industr. Res., India* 15*B* (4), 1956 (183–90). 5 refs. D.S.I.R.

The molecular formula of artocarpin seems to be either $C_{26}H_{30}O_6$ or $C_{26}H_{28}O_6$. Its chemical functions are described.

938. WALKUP, J. H., RUSH, R. I., and HAYWOOD, G. **The extractives of Southern Gum woods.** *Tappi* 39 (6), 1956 (190*A*–193*A*). 13 refs. P.R.

Results of chemical tests on different fractions of extractives obtained from *Liquidambar styraciflua*, *Nyssa sylvatica* and *N. aquatica* are tabulated.

813.3. Ash Constituents

939. MENON, P. K. B. **Siliceous timbers of Malaya.** *Malay. For. Rec.* No. 19, 1956. pp. 55. 13 refs. Price $3·00.

Lists siliceous and non-siliceous timbers under families and genera, and siliceous species also under standard or native names.

813.5. Reaction with Metals

940. **Corrosion by volatile components of wood.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (46–7).

Small specimens of cadmium-plated steel were suspended under warm, moist conditions over samples of a number of woods, and over certain chemicals that might be derived from wood or from glues used in radio cabinets. The most corrosive chemical was acetic acid, followed by formic acid. Of the 10 wood species tested, Oak and Birch caused severe corrosion within 2 months. Moist Birch wood has a relative high pH (4·5), and it is concluded that a progressive development of acidity takes place when the wood is kept under high temperature and humidity, so that the initial pH is not a reliable guide to the extent of corrosion that may be caused under such conditions.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

941. PATSCHEKE, G. Über die Einwirkung von Extraktionsmitteln und Oxydationsmitteln auf die chemische Zusammensetzung und Festigkeitseigenschaften von Holzkörpern. **[The action of extraction and oxidation agents on the chemical composition and strength of pieces of wood.]** *Arch. Forstw.* 4 (5/6), 1955 (545–59). 2 refs. [G.]

The object of these preliminary investigations is to discover the feasibility of altering the properties of wood without destroying its structure, in order e.g. to alter strength properties, to increase permeability, to reduce hygroscopicity, or to create special reaction properties. A chief difficulty is to get an evenly distributed effect throughout the body of the wood. This desired distribution is here investigated with 16 tables of data for (*a*) the extraction of resin with acetone from the heartwood and sapwood of Pine, (*b*) delignification with $NaClO_3$ in Birch and in the heartwood and sapwood of Pine, (*c*) residual (mainly) unaltered cellulose and unaltered pentosans of the (*b*) treatment, and (*d*) the effect of (*b*) on compressive strength. Neither an even removal of resin, nor evenly distributed delignification was attained, but it was demonstrated that the higher the concentration of $NaClO_3$ the lower the resulting strength of Birch and Pine timber.

813.7. Odour and Taste

See No. 1025.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 860, 1063, 1066–7.

942. LIVINGSTON, K. W. **Durability of Alabama-grown Arizona Cypress.** *J. For.* 54 (6), 1956 (400–1). 4 refs.

A service test of 6 untreated fence-posts of *Cupressus arizonica* showed that average length of life was 53 months compared with 30 months for untreated Southern Yellow Pine.

815. Effect of Growth Factors on Structure and Properties

See Nos. 438, 865–6, 869–70, 876, 894, 903–5, 908, 1109, 1115.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

943. BERŠADSKIĬ, A. L. Vlijanie dinamičeskogo ugla vstreči na udeljnuju rabotu rezanija. **[Effect of the dynamic angle of incidence on the specific work in cutting.]** *Derev. Prom.* 5 (1), 1956 (3–5). 1 ref. [Russ.] P.R.

[Cf. *F.A.* 17 No. 3273.] The author defines the dynamic angle of incidence as that between the vector of the cutting force and the (general) direction of the fibres; this angle pre-determines the nature of the deformation and the magnitude of the force required to produce it. For cutting along the fibre direction, this angle is 0°; cutting ⊥ to the direction but ∥ to the plane of the fibres (i.e. lengthwise across) and for cutting ⊥ to both direction and plane of the fibres, it is 90°. Three graphs represent the results of measurements made by M. M. Kozel who in 1954–55 studied the specific work of cutting (with cutterheads) for cutting speeds of 30–90 m./sec., different chip thickness, and angles of incidence varying from 0 to 180°, using Spruce, Ash and Beech, and cutting in 3 directions intermediate between the 3 primary ones above.

944. **[New or re-designed tools and machines of 1955.]** *Timb. Tr. J.* Ann. spec. issue, 1956 (308–20).

Twenty-one firms report on their 1955 models of sawbenches, woodworking machines, peelers, chainsaws etc.

821. Barking

See also No. 482.

945. GAVRILOVA, E. N. Okoročnyĭ stanok Demidova. **[The Demidov barker.]** *Lesn. Prom.* 15 (7), 1955 (13–4). [Russ.]

Illustrated description of a stationary barker having 32 knives arranged uniformly round the circumference. Its output per 8 hours is 43 cu.m. for logs 5 m. long and 7 cm. in diam., and 138 cu.m. for logs [of the same length?] 14 cm. in diam.

822. Saws and Sawing

See also Nos. 998–9.

946. JONES, D. S. **Swedish frame saws.** *Aust. Timb. J.* 22 (5), 1956 (484 . . 498, 563).

Reports a visit to Sweden and covers Swedish practice in sorting logs by diameter for maximum recovery (manually operated and controlled, hydraulically operated and electronically controlled), automatic metal detection, log and deal frame-saws (construction, power, transmission feed and speeds), saw characteristics, capacity and crews of various mill types, and recovery.

947. TENDLER, M. M. Pribor dlja kontrolja veličiny posylki v lesopiljnoĭ rame. **[Apparatus for checking the feed speed in a frame saw.]** *Derev. Prom.* 5 (2), 1956 (21–2). [Russ.] P.R.

Illustrated description of an apparatus designed by the author for the continuous measurement of the feed speed. The apparatus is based on the tacho-generator principle and consists of two parts: the A.C. generator with a permanent-magnet inductor, built into the feeding mechanism, and the apparatus proper, indicating the feed speed.

948. HAYASHI, D. **[Studies on the relation between moisture content and cutting of wood. I. Cutting of wood on the circular saw bench.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (76–8). 3 refs. [Jap.e.] P.R.

Tests with *Cercidiphyllum japonicum* showed that cross-cutting was more influenced by moisture content (m.c.) than ripsawing, the time required for sawing under constant feed force decreasing as the m.c. fell from fibre-saturation point to ca. 10%; below 10% m.c. the time of sawing remained practically constant, but sawing became more and more difficult because of binding.

949. FUKUI, H. **[The influence of the degree of clearance of a hollow-ground ripsaw on the sawing action. I. Relation between clearance and side friction.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (60–4). 7 refs. [Jap.e.] P.R.

It was found that the power consumed by side friction, the time required for sawing, and the work done by sawing, all slowly increased as the degree of clearance (measured by the hollow-grinding angle) decreased from 34′ to 3·9′. The circular saw blades used for the tests were of 10 in. diam. and had 18 teeth. The wood was *Chamaecyparis pisifera*.

950. SAITO, Y., EDAMATSU, N., and OHIRA, Y. **[The effect of tooth bite on cutting forces in ripsawing.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (65–8). 2 refs. [Jap.e.] P.R.

Tests on a gear-feed sawbench with two different circular saws, the tested woods being *Cryptomeria japonica*, *Pinus densiflora*, *Fagus crenata* and *Quercus crispula*, showed that (1) the cutting force of a saw-tooth was proportional to the thickness of the chip cut, irrespective of the feed and cutting speed, until overload conditions were reached; (2) the power demand increased with cutting speed at a constant tooth bite or feed speed; and (3) the dimensional composition of the sawdust (determined by sieve tests) varied linearly with the feed and cutting speed.

951. SUGIHARA, H. **[Studies on sawing with bandsaws. IV. Clearance angle and pitch.]** *J. Jap. Wood Res. Soc.* 2 (1), 1956 (1–4). 3 refs. [Jap.e.] P.R. [Cf. *F.A.* 15 No. 4130; 16 No. 3421.]

952. Contribution à l'étude du sciage au ruban. L'influence de la lame. **[Band sawing. Effect of the blade.]** *Cah. Centre tech. Bois.* No. 17, 1956. pp. 25. [F.] P.R.

This, the first of a series of publications in which the results of bandsaw tests at the experimental sawmill of the Centre Technique du Bois will be described, deals primarily with blades. The 4 main types of saw-tooth envisaged are: (1) Straight-backed ('*denture coucheé*' or '*denture mariée*'); (2) 'hook' type, with the adjacent teeth connected by a rounded gullet, but the top and back meeting at an obtuse angle; (3) 'gum' type, with a flat-bottomed gullet and a straight back, and (4) 'parrot' type, where only a portion of the cutting face (front) is rectilinear, the remainder of the tooth outline being curved. For purposes of this investigation the woods tested are classified into 3 groups: (*a*) hard (e.g. Oak, Ash, Hornbeam), (*b*) semi-hard (e.g. Beech) and (*c*) soft (e.g. Poplar, Lime, and conifers with wide growth rings). The optimum (minimum) specific work of cutting (expressed as rev./min. of the 110-cm. driving wheel) is: for (*a*) chip thickness (c.t.) 0·25–0·3 mm., 500–750 rev./min. for feed rates 10–20 m./min.; for (*b*) c.t. 0·35–0·4 mm., 500–750 rev./min. for feed rates 15–25 m./min.; and for (*c*), c.t. 0·45–0·5 mm., 500–750 rev./min. for feed rates 20–30 m./min. The power consumption decreases rapidly as the hook angle increases (up to 40° for (*b*)); in practice, the maximum hook angle is 30°. Although power consumption is almost independent of the clearance angle, yet there is a perceptible minimum at ca. 12°. The minimum swage width for a blade 1·1mm. thick is 1·7, 1·8 and 2·0 mm. for (*a*), (*b*) and (*c*) respectively. The Duo-Kerf teeth give good results only up to a certain chip thickness (corresponding to a feed rate of 15–18 m./min. for a cutting speed of ca. 40 m./sec., for (*a*) and coniferous wood); these teeth are not suitable for (*c*).

Investigations into chip formation by stroboscope and ultra-rapid photography showed that it is advantageous to round off the transition of the tooth front to the gullet in order to enable the chip to be broken as far as possible from the tooth tip; this has been achieved in the parrot-type tooth. The gullet depth should be chosen in conjunction with the mean chip thickness; very thin chips must be avoided; Duo-Kerf teeth can be used, provided the feed rate is not excessive. All these measures result in a better ejection of chips.

Other tests showed that perforation is not the best remedy for reducing the time and labour required for the tensioning and dressing of blades; encouraging preliminary results were obtained with 'fluted' blades. Saving of wood can be secured by: reducing kerf width; providing a suitable mean hook angle; reducing the depth of gullet; perfect tensioning and dressing of blades; guiding the blade, and working with well sharpened blades, with suitable values for speed of cutting and chip thickness. To increase the feed rate (and, consequently, the yield) it was found necessary to use a blade well tensioned and guided; to use teeth with good chip ejection, e.g. of the parrot-hook type, with a large gullet depth and large hook angle, and a powerful motor. It was found advisable, for softer woods, to elongate the tooth tip during swaging.

In order to increase the time of service of a blade (time between two sharpenings), it is recommended (1) to use a fairly hard nickel-chrome resistant to deformation; (2) to adhere to the prescribed chip thickness; (3) not to exceed 40 m./sec. speed of cutting, and (4) not to use sharpness angles $< 50°$ for (*c*), and 55° for (*a*) (teeth of the parrot and hook types are recommended).

Appendix I deals with the sawing of difficult woods (frozen, woolly Poplar, Ash, Maritime Pine, very dry coniferous woods); Appendix II contains tables for calculating chip thickness.

953. Dentures perroquet. **['Perroquet' ['parrot'] saw-teeth.]** *Feuille tech. Centre tech. Bois* No. *S* 1, 1955. pp. 2. [F.] P.R.

In these, only a portion of the cutting face is rectilinear, all other portions of the tooth outline being curves merging with one another and with the straight-line portion. Thus, for teeth with pitch of 45 mm. and gullet depth 13 mm. (the types preferred for hard wood), the radius of curvature (concave) between the straight-line portion and the gullet is 6 mm., while that of the (convex) curvature beginning at the tooth tip and extending along the back is 60 mm. For soft wood the pitch is 50 mm., the depth of gullet 17 mm., and the radii of the two main curvatures, 8 and 70 mm., respectively. It is claimed that this improved 'hook'-type tooth assures the highest output and the best ejection of chips. It is much stronger than other types. The hook angle in these teeth varies between 20° and 30°, and clearance angle (between the tangent to the curve at the tooth tip and the tooth-tip line) between 8° and 10°. Recommended cutting rates are 35, 45, and 40 m./min. for hard wood, soft wood (e.g. Poplar), and coniferous wood, respectively.

954. Denture double trait. **[Duo-Kerf saw-teeth.]** *Feuille tech. Centre tech. Bois.* No. *S* 2, 1954, pp. 1. [F.] P.R.

Tests made at the Centre Technique du Bois showed that the reduction of power consumption (which, along with a better ejection of chips and a cleaner cut, is an advantage of this type of tooth, based on the American Duo-Kerf) remains significant only until the feed rate attains (for French indigenous woods) a value of 15–18 m./min. The teeth are of two types; a higher and narrower tooth (chipper), followed by a lower and broader one (side dresser), and so on, thus assuring a division of labour between the two. The narrower teeth should not be set at all, while the swage of the lower teeth (5 mm. lower than the higher ones) should be 1·8 mm. for a blade thickness of 1·1 mm. [Cf. *F.A.* 17 No. 3283.]

955. Kerr, J. S. **Ripsaw teeth for exotic Pines (recommended sawmill practice).** New Zealand Forest Service, Wellington, N.Z., 1956, pp. 55.

Contains chapters on: design of ripsaw teeth, circular saws, gang [frame] saws, bandsaws, and welding.

956. Ljanguzov, A. V. Elektrokontaktnaja zakalka pljuščenyh zubjev ramnyh pil. **[Electrical contact hardening of swage-set frame-saw teeth.]** *Derev. Prom.* 4 (12), 1955 (16–7). [Russ.] P.R.

Describes and illustrates a device developed in a Russian sawmill and used as an attachment to an automatic sharpening machine. When the (A.C.) current circuit is closed, the tip of the saw tooth is heated to the desired temperature round the contact spot; when the circuit is opened, it cools down quickly and is hardened. The contact time can vary, according to the blade thickness, from 2 to 30 sec., the current intensity being 320–380 amp. The hardened teeth show a greater resistance to wear and good metallographic structure. To prevent chipping and breakage, the main heating should be followed by annealing at 200–250° C. The hardness of the tooth tips should be ca. 65 Rockwell. The author recommends the following procedure: (1) preliminary heating of ca. ⅓ of the tooth to 600–650° C. for 15–20 sec., with a gradual decrease of temperature through a series resistance; (2) swaging of the tooth; (3) preliminary sharpening; (4) hardening by heating to ca. 800° C. for 1·5–2 sec., followed by quick cooling; (5) final sharpening and (6) side dressing.

957. Edamatsu, N., and Ohira, Y. **[Studies on setting methods of bandsaw tooth (Report 1). On the deformation at the tooth point by swaging.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 82, 1955 (1–20). [Jap. jap.e.*e.*]

Covers the theoretical and experimental aspects of swaging and tooth deformation, the relations of which are demonstrated. Satisfactory swaging (solely dependent in Japan on the filer's experience) requires easier setting of anvil and die and also the means of ensuring the highest precision in the finish of the teeth.

958. Edamatsu, N., and Ohira, Y. **[Method of sharpening swaged bandsaw teeth.]** *J. Jap. Wood Res. Soc.* 2 (1), 1956 (19–23). 4 refs. [Jap.e.] P.R.

Investigates the sharpening of swaged bandsaw teeth in association with the conditions of swage setting. As long as the imprint of the swaging die is visible, the tooth should be ground from the front edge; after this imprint has been removed, grinding must be done from the back of the tooth. Grinding from both sides is imperative for maintaining the unchanged tooth shape, but this grinding should not affect the amount of swage setting.

823. Planing, Cutting of Mouldings, Chiselling, Mortising and Tenoning, Boring, Turning

See also No. 943.

959. **Planing investigations.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (21–4 + 2 photos).

The formation of planing chips was studied, using a stroboscope with a flashing rate equal to, and slightly less than, the speed of rotation, and by means of electronic flash equipment (5μsec. duration). The chip produced in rectilinear cutting is usually of uniform character and is shorter and thicker than the actual portion of wood from which it is formed, this change in dimensions varying according to cutting angle, depth of cut and grain direction. Slow-speed apparatus has so far been used for the tests, but a prototype high-speed machine has been constructed. Preliminary tests with this machine provided information about the failure of the wood near the cutting edge and the relationship between chip dimensions and the original length and depth of cut under different conditions. The friction between the moving wood and the machine table in a specially designed planer was in general greatest with the newly planed surface (back table), slightly less during cutting (owing to the effect of vibration) and least at the front table. The eight timbers used in this part of the investigation showed different behaviour, but the coefficient of friction (frictional resistance to feed movement) increased with the speed of feeding. Tests made on the same machine

with 6 species (cutting angle 30°, feed rate 20–60 ft./min.) showed that $P = A + Bf$ (P is the power required; f, feed speed; A and B, constants). The energy consumption per unit area decreased as the feed rate increased.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

960. **Strength of nailed joints.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (16–7).

Analysis of the results of tests on the stiffness and the strength of 2-member and 3-member joints shows that the correlation coefficients between the sp. gr. and the loads required to cause slips of 0·006 and 0·030 in. in the joints vary appreciably; most coefficients, however, above 0·60, show a close relationship between the stiffness and strength of the joints and sp. gr. of the wood. A relationship $P = Kd^n$ has been found to exist between the stiffness and strength of the joints and the diameter (d) of the nail, P being the load, and K and n, constants. K being roughly proportional to sp. gr. (G), the relationship can be represented as $P = kGd^n$ where k is a constant. For joints of parallel members made with No. 8-gauge nails, the diam. of pre-drilled hole giving the greatest all-round increase in stiffness and strength is $\frac{5}{64}$ in., this being also the amount by which the diam. of the hole is less than the diam. of these nails.

824.7. Glued Joints

961. Ławniczak, M. Wpływ sęków na wytrzymałość spoiny klejowej. [**Effect of knots on the strength of the glue line.**] *Sylwan* 100*A* (3), 1956 (60–9). 16 refs. [Pol.russ.e.]

Results of tests on test-pieces obtained by gluing knotty Pine wood (with controls made of clear wood) show that: (1) knotty converted wood is less easily glued than clear wood, a particular weakening of the glue line occurring near the knots; (2) the adverse effect of the knots can be eliminated by planing them down by 1–2 mm.; under a constant gluing pressure of 6 kg./sq. cm. these 1–2 mm. depressions disappear. The 'Imperkol' gluing method [see *F.A.* 17 No. 4450] was used.

962. Zenkteler, M., and Grzeczyński, T. Sposoby badań wytrzymałości połaczeń klejowych. [**Methods of testing the strength of glue joints.**] *Przem. Drzewny* 7 (2), 1956 (55–60). 14 refs. [Pol.] P.R.

Illustrated description of test-pieces prescribed by different national standards for the testing of glue joints.

963. **Strength of glued joints.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (17–8).

Exploratory tests with joints of members of structural size, using synthetic-resin glues, have shown that, when they are under load, initial failure may occur in the wood of the members, with distortion of the test-piece, before the stress is sufficient to cause shear failure in the glue lines or close to them. With 3-member joints, the glue can be stressed up to 1000 lb./sq. in. when the load is applied $\parallel$ to the grain of the members, but when it is $\perp$, failure occurs at a much lower stress. Work on these points is continuing.

964. **Strength of plywood. Effect of adhesive on strength.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (18).

Results of tests on panels of *Aucoumea klaineana* (using veneers of different thickness and 3 types of adhesive) showed that strength is apparently affected by (1) permanent compression of the wood during bonding and (2) the formation of thin layers of a composition of wood and adhesive. Greater strength is usually obtained with thinner veneers, and with phenolic rather than urea resin.

965. Mori, T., and Imaizumi, S. [**Shear test for wood with glue lines (Preliminary report).**] *J. Jap. Wood Res. Soc.* 1 (2), 1955 (76–9). 6 refs. [Jap.e.] P.R.

Tests on stepped shear blocks (Japanese Industrial Standard) of laminated *Cryptomeria japonica* show that the position of the glue lines has no significant effect on shear strength, whereas the decrease, within a certain range, of the shear length caused a slight increase in the shear strength value.

824.8. Glues and Gluing

See also Nos. 961–5, 1033, 1035.

966. Sokolov, B. N. O naprjaženijah v kleevyh prosloĭkah fanery. [**Stresses in plywood glue lines.**] *Derev. Prom.* 5 (2), 1956 (10–3). [Russ.russ.] P.R.

Analysis of Krotov's equations [source not quoted] for normal stresses in the face veneers and centre plies of plywood gave the following conclusions: (1) changes in moisture result in normal and shear stresses being produced in cross-banded glued wood; (2) the shear stresses are concentrated along the edges, on the checks and cracks and, particularly, at the corners of the panel, and they penetrate some distance into it; (3) in multi-ply wood the shear stresses along the edges in the outermost glue lines are twice (at the corners 2·2 times) as great as along the edges of the inner glue lines.

967. Hart, C. A. **Effect of temperature variation on the results of the cyclic exposure test for glue bond durability.** *For. Prod. J.* 6 (7), 1956 (247–51).

Cyclical soaking and drying tests on plywood for water-resistant bonding showed that glue-line resistance at air and water temperatures of 95° F. was only about $\frac{1}{3}$ of that at 70°. The higher temperature of the soaking water affected the result more than that of the air in drying. The two temperatures were chosen as the normal limits of room temperature prescribed in the test specification.

968. Pearson, W. J. **Preliminary report on a proposed new method of estimating the service life of exterior grade plywood.** *For. Prod. J.* 6 (6), 1956 (221–4). 4 refs.

A description of experiments in progress at the Forest Products Laboratory, Vancouver, on the rate of reduction in the strength of phenolic resin bonds (of 4 different glue strengths) of Douglas Fir plywood [face] veneers, aiming at comparing the results of accelerated weathering tests (boiling and

drying) of increasing severity (i.e. repetitions) with those of varying periods of natural weathering of unprotected and painted panels. No results are yet available.

969. KNIGHT, R. A. G., NEWALL, R. J., and GROSERT, J. E. **Investigations into glues and gluing. Progress report 94—May 1956. Durability tests on plywood adhesives—series II. Tenth year and final report.** Forest Products Research Laboratory, Prince Risborough. 1956. pp. 13. Limited distribution. P.R.

970. KNIGHT, R. A. G., DOMAN, L. S., and SOANE, G. E. **Investigation into glues and gluing. Progress report 95—June 1956. The durability of assembled glues—Section A. Final report on the plyclad frames after ten years' exposure.** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 16. Limited distribution. P.R.

971. ZABRODKIN, A. G. Refraktometričeskiĭ metod opredelenija koncentracii močevinnyh smol. [**A refractometric method of determining the concentration of urea resins.**] *Derev. Prom.* 5 (3), 1956 (8–10). [Russ.russ.] P.R.

Describes a method for rapid determination of the concentration of urea and phenolic resins, formaldehyde, ethanol, and NaOH. It can also be used to determine the end of the resinification reaction in the process of condensation.

972. ZABRODKIN, A. G. Karbamidnye smoly i ih primenenie v mebeljnoĭ promyšlennosti. [**Carbamide [urea] resins and their use in furniture industry.**] *Derev. Prom.* 4 (10), 1955 (3–5). [Russ.] P.R.

Describes the conditions of condensation and hardening of urea resins and of their application. The main urea glues produced and used in the U.S.S.R. are described.

973. TEMKINA, R. Z. Karbamidnye smoly dlja proizvodstva fanery. [**Carbamide [urea] resins for plywood manufacture.**] *Derev. Prom.* 4 (12), 1955 (12–4). [Russ.] P.R.

Urea resins are more suitable than phenol resins as substitutes for the casein or albumin glues so far used in the U.S.S.R., particularly because their gluing time is nearly the same as that for casein and albumin. The optimum molecular urea/formaldehyde ratio in the urea glues is 1·5–1·65. The reaction to effect the condensation of the resins is first conducted at pH 7·5 (small addition of NaOH), and then at pH 6 (addition of NH_4Cl). The optimum temperature is 80–90° C.

974. KAČAN, V. F. Uskorenie processov skleivanija drevesiny sintetičeskimi smolami bez podogreva. [**Acceleration of the processes of wood gluing with synthetic resins without heating.**] *Derev. Prom.* 4 (11), 1955 (3–6). [Russ.russ.] P.R.

Cold gluing tests were carried out at the Lvov Institute of Timber Technology, using MF-17 urea-formaldehyde resin (with 8% by weight of 'typhooned' wood flour as filler) and CNIIFM-M-4 resin. The hardening agent (catalyst) used was 'kerosene contact' (probably a mixture of 'naphthenic acids'), the proportion used varying between 20% and 133% of the resin weight. The resin was applied to one surface, the catalyst to the other, and both surfaces were brought together; alternatively, the resin was applied to both surfaces and an interlayer impregnated with the catalyst was inserted between them. For the MF-17 resin (250 g./sq. m.) an addition of 20% by weight of the catalyst was found to be the optimum; for the other resin (150 g./sq. m.) 33%. Other optima for both were: closed assembly period 5 min., pressure 5 kg./sq. cm., pressing time 15 min. Although shear strength markedly increases for 24 hours after pressing, glued objects can be safely subjected to woodworking 1 or 3 hours after pressing, for the CNIIFM-M-4 and MF-17 glue respectively. All these results were obtained with Scots Pine. Tests with Oak and Beech showed that cold gluing results in glue-line strength comparing well with that of hot-pressed glue lines.

975. BERDINSKIH, I. P. Grafičeskoe rešenie zadač dvustoronnego kontaktnogo nagreva skleivaemoĭ drevesiny. [**Graphical solution of problems of bilateral contact heating in wood gluing.**] *Derev. Prom.* 5 (4), 1956 (13–6). [Russ.] P.R.

976. JANSON, È. R. Skleivanie pilenyh poverhnosteĭ drevesiny. [**Gluing of sawn wood surfaces.**] *Derev. Prom.* 5 (4), 1956 (3–5). 1 ref. [Russ.russ.] P.R.

Results of a study of the effect on the strength of glue joints of surface smoothness, specific pressure and the amount of glue used. The tests were made on *Pinus sylvestris* blocks, 50 × 50 × 65 mm., the synthetic-resin glue KB-3 (cold polymerization, viscosity 30–60° FE [Engler?]) being applied to both surfaces. The surfaces tested were: (*a*) hand-planed (maximum roughness 34–84μ) [cf. *F.A.* 17 No. 2190]; (*b*) machine-planed (52–156μ); (*c*) sawn with a hollow-ground circular saw (78–163μ); (*d*) sawn with a circular saw with spring-set teeth (120–370μ), and (*e*) sawn by a frame-saw (290–650μ). The moisture content of the test blocks was 8–10%, the specific pressure varied from 0 to 10 kg./sq. cm., and the amount of glue from 150 to 500 g./sq. m. For glue at 200 g./sq. m. and a pressure of 1 kg./sq. cm. the shear strength of the glue joint was found to be practically the same for surfaces (*b*)–(*e*) viz. 70 kg./sq. cm., but nearly 100 kg./sq. cm. for (*a*). Pressures of 3 and 5 kg./sq. cm. give almost the same result. At a pressure of 10 kg./sq. cm. (*e*) gave almost the same glue-joint strength as (*a*), whereas that of (*b*) was much lower. It is concluded that the strength of the glue joint depends not only on evenness of surface, as expressed by the maximum roughness, but also on the method of surface preparation, which determines the nature of the surfaces (e.g. woolliness). Gluing at 10 kg./sq. cm. gave extremely reliable results in all cases. For surfaces (*a*)–(*c*), an increase of glue above 150–200 g./sq. m. did not add appreciably to joint strength; but with surfaces (*d*) and (*e*) an increase from 200 to 350 g./sq. m. somewhat increased the strength. For the same values of maximum roughness, (*d*) and (*e*) give higher strength values than (*a*)–(*c*). Pressures recommended: for surfaces (*a*) and (*b*) 1–3; for (*c*) and (*d*) 3–10; and for (*e*) $\lessdot$ 10 kg./sq. cm.

977. **Study of temperature penetration rates in the manufacture of plywood.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (27–8).

[Cf. *F.A.* 16 No. 1023.] The work has been extended, and heating curves for ½-in. plywood of 4 species at various moisture contents have been determined for two pressing temperatures. The equation of heat conduction allowed the heating times for the innermost glue line for a pressing temperature of 95° C. to be determined only within the limits of − 15 and + 5%. For 115° the accuracy was no better, the temperature of the innermost glue line at the edge being, at the end of the pressing cycle, still below that at the centre. The extent of this temperature gradient was influenced by the moisture content of the veneers being pressed. Although the platen temperature of 115° was never attained at the edge of the test boards, the glue bond was satisfactory. The reason for obtaining this cure at temperatures below that recommended is being discussed with the glue manufacturers.

978. MIHAÏLOV, A. N. O progreve paketov fanery v gorjačih pressah. **[Heating of plywood assemblies in hot presses.]** *Derev. Prom.* 4 (11), 1955 (10–1). [Russ.] P.R.

The places in which the least heating of glue lines occurs in a plywood assembly heated between press platens, are the middle glue lines in the assembly corners, usually at a distance of 75–100 mm. from the respective sides. It was found that two equations for determining the temperature or the time of heating, proposed by Soviet authors, while expressing accurately conditions at the centre of the assembly, are inadequate for these coldest spots. A new formula was developed at the Soviet Central Institute of Scientific Research on Plywood and Furniture, viz.

$$\tau = KS^2 \log\left(1{\cdot}273\,\frac{t_1 - t_0}{t_1 - t_k}\cos\frac{\pi x}{S}\right)$$

$$\text{or } \tau = \left(\frac{t_k}{M}\right)^a S^2$$

where τ is the time of heating of the glue line (min.) in its coldest spot (see above), S = thickness of the assembly before pressing (cm.), t_1 = platen temperature, t_k = end temperature of the coldest spot, x = distance between the central (horizontal) plane of the assembly and the nearest glue line, K is an empirical coefficient of heating intensity in the edge zone (min./c.c.), as given in a table, t_0 = the initial temperature of the assembly, and M and a are constants shown in a table. Another table shows that the calculated figures agree very well with results in practice.

979. MIHAÏLOV, A. N. Režimy skleivanija fanery fenolo-formaljdegidnoï smoloï S-1. **[Schedules for gluing plywood with S-1 phenolformaldehyde resin.]** *Derev. Prom.* 5 (1), 1956 (12–6). 1 ref. [Russ.] P.R.

The author's experiments on the hardening of phenol-formaldehyde glues showed that the formation of (water-insoluble) resitol and resite does not begin simultaneously with thermal treatment. During phase I of heating, condensation proceeds without reaching the resitol stage; the phase II is characterized by the formation of an increasing proportion of resitol/resite mixture and phase III by the formation of resite, free from both resol and resitol. It was found that the time (T) required to produce in a glue a certain proportion of water-insoluble condensation products at a temperature t is given by a family of straight lines (on semi-log paper) derived from the relationship $T = B \times A^{100-t}$, A and B being constants for a given proportion (0–85%) of water-insoluble fractions. The above formula was developed for a resin having a viscosity of 150 ± 15° Engler. Other experiments showed that the duration of phase I was longer or shorter for less or more viscous resins respectively. In mixtures of resins having different viscosities, the beginning of phase II was that of the more viscous one, whereas the end of this phase was that of the less viscous one. While the above experiments were made at constant temperatures, the picture was roughly the same under factory conditions when the temperature gradually rose. The main difference lay in the dependence of the time required to attain a certain proportion of insolubles, on the rate of heating; the thickness and heat conductivity of the assembly also played an important part. A formula was developed for the time (τ_c) required to produce a strong glue line: $\tau_c = CKS^\beta$, where S is the thickness of the packet, K and β are constants given in a table for 3 different platen temperatures and 3 different proportions of insoluble glue components, and C is a coefficient allowing for the position of the glue line in the assembly. (This formula is valid for the Soviet resin S-1, when the moisture content of the assemblies is 12%, their thickness 3–50 mm., the pressure range 17–22 kg./sq. cm., and temperature range 135–150° C.) The fundamental equation for gradual heating is:

$$\frac{\tau_1}{T_1} + \frac{\tau_2}{T_2} + \ldots \frac{\tau_n}{T_n} = 1$$

where the τ values are times (in min.) required to raise the temperature of the glue line within each very small temperature range, and the T values are times (in min.) required to complete the desired degree of hardening at the mean temperature of this range. The summation of these quotients should begin with 80° C., since at lower temperatures the process is very sluggish. A table for simplifying this summation between 80 and 140° is given, and it is claimed that the time of heating can be determined by this method with an error ≯ 5%. A numerical example is given. An investigation on the relationship between the content of insoluble products of condensation and the shear strength of the glue line showed that, whereas dry test-pieces reached maximum strength when the proportion of insolubles was 65–70%, a proportion of 85% was required to achieve the same strength after boiling in water.

980. KOBLIKOVA, A. G. O vyderžke gnutokleenyh detaleï, skleennyh kazeinovymi klejami. **[Holding bent-and-glued objects under pressure when using casein glues.]** *Derev. Prom.* 4 (11), 1955 (8–9). [Russ.] P.R.

To find the relationship between the time of cold pressing, moisture content (m.c.) of the wood, and shear strength of the glue line, tests were made on Birch veneer 1, 2, and 2·8 mm. thick, glued together with lime-casein glue (casein 100, slaked lime 25, and water 100 parts by weight). It was found that the smaller the m.c., the greater the strength. Maximum strength was reached after 18–22 days, when the m.c. fell to the equilibrium value (11–12%). The strength of test-pieces from 2-mm. veneer was greater than that from 2·8-mm. veneer, and both were weaker than solid wood. For glued veneers $\geqslant$ 2 mm. thick, 2 hours' pressing sufficed. The m.c. of articles taken out of the press should not exceed 27%. Correlation equations were established between m.c. and the shear strength of glued [layered] wood. These results were corroborated by observations made in working conditions; the strength of bent-and-glued articles was slightly lower than that of the glued test-pieces, but otherwise the results were concordant. Bent-and-glued articles must be first kept at room temperature (ca. 20° C.) for at least 12 and 52 hours if the ensuing drying is conducted at 45° and 60° respectively.

981. FINOŠIN, A. E. Avtoklavnoe fanerovanie profilirovannyh detaleĭ. **[Veneering of shaped details in an autoclave.]** *Derev. Prom.* 4 (12), 1955 (25–6). [Russ.] P.R.

Illustrated description of a method of veneering furniture parts of intricate shapes, using vacuum rubber bags with valves of special design, and an autoclave with a capacity of 3 cu.m. Times required: (1) from glue spreading to application of pressure, ca. 60 min.; (2) pressing (80–100° C., 0·7–1 atm.), 15 min., and (3) cooling in the press, 30–60 min.

982. HYLER, J. E. **Glues and gluing. Parts 86–92.** *Sth Lumberm.* 192 (2405), 1956 (57 . . . 60); 193 (2406–2411), 1956 (45 . . . 49; 57 . . . 62; 51 . . . 54; 57 . . . 63; 57 . . . 63; 75–76).

Gluing moulded parts. Clamps etc.

983. CARRUTHERS, J. F. S., and SOANE, G. E. **Radio frequency and other heating processes. Progress report 13—March 1956. The application of radio frequency heating to a batten-to-plywood glued joint.** Forest Products Research Laboratory, Princes Risborough. 1956. pp. 8. Limited distribution. P.R.

825. Cleaving. Adzing. Mechanical Comminution

984. VA. Der neue Hombak-Zerspaner. **[The new 'Hombak' chipper.]** *Holz-Zbl.* 82 (96), 1956 (1183). [G.]

Describes a German machine with a capacity of 2 or 4 tons/hour respectively for wood pieces 28 cm. and 56 cm. long, and a chip thickness of 0·3 mm. Thickness of chips can be varied from 0·1 to 1·0 mm., and their length from 15 to 45 mm. Another model can use any length of slabs etc., but is more suitable for smaller quantities.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

985. KOVJAZIN, N. V. Centrovočno-zagruzočnoe prisposoblenie k luščiljnomu stanku. **[Combined centring and loading apparatus for a peeling lathe.]** *Derev. Prom.* 5 (1), 1956 (22). [Russ.] P.R.

Illustrated description of an apparatus based on the principle of centring from 4 sides.

986. SHVARTSMAN [ŠVARCMAN], G. M. **Preparation of peeler knives for work.** *Transl. For. Prod. Lab., Can.* No. 94, 1956 pp. 6 + 3 dgms., 1 gph. Transl. from *Derev. Prom.* 4 (7), 1955 (11–4). [See *F.A.* 17 No. 2042.] P.R.

987. KIVIMAA, E. **Investigating rotary veneer cutting with the aid of a tension test.** *For. Prod. J.* 6 (7), 1956 (251–5). 6 refs.

Tension tests $\perp$ to the grain, combined with tests on comparable samples of the same wood prepared by planing and sawing, were used to measure the quality of $\frac{1}{8}$-in. Yellow Birch veneer, cut at Madison under various nosebar pressures. While quality initially increased with greater pressure, it declined rapidly after a certain point, where nominal thickness also was markedly affected, suggesting permanent deformations in the structure of the wood.

827. Bending. Moulding (other than by Cutting)

See also Nos. 980–2.

988. **[Wood bending.]** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (13–4 + 1 photo).

Mentions and illustrates an improved method of applying end pressure when making bends with commercial-type machines, by means of hydraulically operated rams which apply an end thrust to the end of blanks via a plate fitted into the end of the supporting strap; the end pressure can be thus adjusted and controlled throughout the bending operation.

989. MANKEVIČ, L. A. Vlijanie nekotoryh faktorov na kačestvo gnutjja drevesiny. **[Effect of some factors on the quality of wood bending.]** *Derev. Prom.* 5 (1), 1956 (10–2). 3 refs. [Russ.] P.R.

For converting Beech logs, bandsaws (for ripsawing parallel to the bark) and hollow-ground circular saws (for cutting blanks from boards) are recommended for their higher yields and better surface quality. Radial bending (force applied in the radial direction) for curvature radii $\leqslant$ 150 mm., and tangential bending (force applied tangentially) for smaller radii (e.g. 50–80 mm.) are recommended. The use of metal straps in all cases reduces the % of rejects.

829.1. Finishing

See also No. 1023.

990. CIMBANENKO, E. G., KOSSOVSKIĬ, G. N., and KUŠŊIRSKAJA, M. C. Proizvodstvo dekorativnoĭ bukovoĭ fanery. **[Manufacture of decorative Beech plywood.]** *Derev. Prom.* 5 (1), 1956 (8–10). [Russ. russ.] P.R.

Investigations in 1954, at the Ukrainian Institute of Scientific Research on the Mechanical Processing

of Wood, on the staining of Beech flitches for sliced veneer showed that: (1) Beech can be stained to imitate Walnut, Mahogany or Grey Sycamore; for this purpose the flitches are first stored for ca. 3 months in water, and then put into an autoclave where they are first steamed, then subjected to a vacuum and finally impregnated with the staining solution at pressures up to 10 atm.; (2) the best light-fastness and optical effect (enhancing the texture) are shown by humin dyes and some metal salts (e.g. $FeSO_4$); (3) the stained wood is easily polished, scraped, and varnished; (4) butt flitches gives the best figure. A series of recipes for staining solutions and a description of the process are tabulated.

991. KIKATA, Y. **[Studies on wood sanding. I.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (79–84). 6 refs. [Jap.jap.e.] P.R.

The rate of abrasion in belt sanding was found to increase with the load and the sanding velocity. Empirical or semi-empirical formulae are given for the relationship between the bite of each grain edge and the load, and between the roughness of the sanded surface and grain size. The optimum values of load and sanding velocity must be determined for these two factors jointly.

992. SCHMIDT, H. **Upgrading lumber by repair: knot boring and plugging.** *B.C. Lumberm.* 40 (8), 1956 (114 . . . 118).

Covers selection of timber for treatment, operation of the Raimann knot borer and plugger, its performance and costs, and the detailed results of a test run of Ponderosa Pine showing an estimated net gain in value of $54·80/1000 bd. ft.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 942, 1044–5, 1047–9, 1081.

993. Le bois de feu et le charbon de bois au service du chauffage domestique. **[Firewood and charcoal as domestic fuel.]** *Cah. Centre tech. Bois* No. 16, 1956. pp. 19. 7 refs. [F.] P.R.

Discusses (1) firewood: form, composition, calorific value, advantages; (2) burning of wood: inflammability, combustibility, residues, wood-burning appliances in general; (3) wood-burning appliances: stoves, central-heating boilers, cookers, water-heaters etc., and (4) charcoal as domestic fuel.

994. BROWN, N. C. **Piling.** *Wood* 21 (7), 1956 (282).

Discusses the species locally used round the coast and inland waters, specifications, applications etc., of the 8–10 million piles annually used in the U.S.A. Stumpage is second only to that of prime peeler plywood logs. Douglas Fir, Southern Pine and species of Red and White Oaks are the principal sources in the west, south and east respectively.

995. **Cross-arms from eastern and south-eastern Australian hardwoods.** *Aust. Stand.* No. 0·61, 1955. pp. 7. Price 3*s*. P.R.

996. BENIĆ, R. Razmatranje o iskorišćenju oblovine kod izrade pragova. **[Economic utilization of roundwood for the manufacture of railway sleepers.]** *Šum. List* 79 (11/12), 1955 (621–34). 3 refs. [Croat. croat.e.g.]

The new Jugoslav standards (JUS D.) *B* 4026, *D* 1020 and *D* 1021 dealing with different kinds of sleepers are discussed, and tables developed by the author are given for calculating the yield of sleepers from roundwood in accordance with the standards. [Cf. *F.A.* 17 No. 3315.]

832. Mills, Their Functions and Products

997. La protection contre l'incendie dans les industries du bois. Le rôle de la détection automatique. **[Protection against fire in the wood industries. The role of automatic detection.]** *Cah. Centre tech. Bois* No. 9, 1955. pp. 11. [F.] P.R.

Contains an article on the application of fire protection to wood industries (*Camus*), giving some statistical data and discussing the principles of fire prevention and control and of fire detection. Automatic fire detection is dealt with in an article in which different types of detecting instruments are described and illustrated (*R. Gautier*).

832.1. Sawmills and Planing Mills

See also Nos. 840, 946 *et seq.*, 996.

998. **Handbook for small sawmill operators prepared by the Logging and Milling Committee, Forest Products Research Society.** *For. Prod. J.* 6 (3–8), 1956 (105–8; 137–42; 190–3; 209–12, 258–63; 302–7).

Introduction (*F. C. Simmons* and *J. S. Bethel*); Part I, Machinery (*M. H. Mater* and *E. Clevenger*); Part II, Saws (*E. A. Mayberry* and *D. Gommel*); Part III, Mill set-up (*K. C. Compton* and *G. E. Bell*); Part IV, Mill operation and trouble shooting (*D. P. Thomas* and *C. D. Carpenter*) and Glossary and Appendix [reference tables] (*W. J. O'Neil* and *J. P. Sims*]. The 6 parts will be published as a bulletin by the American Society of Mechanical Engineers.

999. HYLER, J. E. **Modern sawmilling. Parts 47–53.** *Sth. Lumberm.* 192 (2405), 1956 (37 . . . 40); 193 (2406–2411), 1956 (35 . . . 40; 41 . . . 46; 35 . . . 42; 39 . . . 44; 39 . . . 44; 51 . . . 54).

Saw maintenance; portable and small mills.

1000. DIJKMANS, M. A. F. **Report to the Government of Thailand on sawmill modernization.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 479, 1956. pp. 69. Limited distribution.

1001. MACGREGOR, J. J. **Production in the Swedish sawmill industry (an examination of Dr. Bertil Thunell's study).** *Forestry* 29 (2), 1956 (119–36). [Cf. *F.A.* 15 No. 4178.]

1002. SHELTON, N. T. **Chip yield and materials balance as related to log size in the California Pine and Fir region.** *For. Prod. J.* 6 (8), 1956 (281–4).

Presents graphs and tables showing the quantities of green lumber, green chippable waste and green sawdust in logs of various sizes, chiefly of *Pinus*

ponderosa and *P. lambertiana*, the lumber component being expressed either in cu. ft. or in 1000 bd. ft. Species differences were negligible.

1003. WORTHINGTON, N. P. **Lumber-grade recovery from 110-year-old Douglas-Fir thinnings.** *Res. Note Pacif. Nthwest For. Range Exp. Sta.* No. 121, 1955. pp. 6. 6 refs.

The thinnings produced 98 16-ft. logs of 6- to 19-in. diam. Of these only 52% were of the No. 1 common or better lumber grade, possibly because Douglas tends to develop unsound black knots after 100 years.

1004. SIMMONS, F. C. **The milling of Beech.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 16, 1956. pp. 27. 4 refs.

Discusses points for consideration in the conversion of *Fagus grandifolia*, and the handling, storing, and marketing of the timber. Methods of sawing are shown, with illustrations.

1005. LITTLER, G. F., and ADKINS, B. **The milling of hardwoods in South East Queensland.** *Res. Notes Qd. For. Serv.* No. 1, 1954. pp. 44 + 3 dgms., 12 gphs.

The study was based on 522 logs of 14 species in 13 mills. The main points revealed were: (1) sawn recovery from a log can be determined as a function of its gross volume and of the defect which it contains; (2) for logs of the same size and defect, there are no differences between species so far as green-off-saw recovery and production rate are concerned; (3) defect occurred primarily as faulty heart (pipe), which has no effect on milling time; (4) above 18–20 ft., log length has little effect on average sawn length.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 961 *et seq.*, 985–7, 990, 1017, 1019–21, 1026, 1029–30, 1033, 1035–6, 1052–4, 1106, 1109–10.

1006. MAROTTE, P. L'industrie du tranchage en France. **[The veneer industry in France.]** *Rev. for. franç.* 8 (7), 1956 (495–504 + 9 photos). [F.]

Describes the principal species used and defects occurring in veneer logs.

1007. **Manufacture and general characteristics of flat plywood.** *Rep. U.S. For. Prod. Lab., Madison* No. 543 (rev.) 1956. pp. 15. 7 refs. P.R.

1008. DIMOCK, E. J. **Peelers from pruned Douglas Fir.** *Timberman* 57 (9), 1956 (74, 76).

Commercially acceptable face veneers (grade A) as well as knotty veneers (grade C) were obtained in experimental peeling of 2 trees from a 56-year-old stand pruned 18 years earlier. Veneer cut from immediately outside pruned knots showed little distortion of wood structure. Future use of pruned young-growth Douglas Fir is considered promising.

1009. **Trials of timber for plywood manufacture. Progress Reports 34–39.** Forest Products Research Laboratory, Princes Risborough. 1956. Each pp. 7 or 8. Limited distribution. P.R.

Covering numbered consignments of Red Seraya (*Shorea smithiana*), Yellow Seraya (*S.* (*Richetia*) sp.), Kapur (*Dryobalanops lanceolata*), Keruing (*Dipterocarpus tawensis*), White Seraya (*Parashorea plicata*), and Red Seraya (*Shorea parvifolia*), all from North Borneo.

1010. NARAYANAMURTI, D. **Plywood and improved wood from Indian timbers, their properties and uses.** *Bulletin, National Institute of Sciences of India, New Delhi* No. 6, 1955 (168–82 + 2 photos). 5 refs. P.O.

Describes and records properties of plywood and various types of improved wood made at Dehra Dun.

1011. PAŠINA, V. P. Fiziko-mehaničeskie svoïstva bukovogo špona. **[Physical and mechanical properties of Beech veneer.]** *Derev. Prom.* 5 (3), 1956 (10–1). [Russ.] P.R.

The following properties of veneer made from Carpathian Beech are presented in tables and graphs: density of (sap- and heartwood) veneer and solid wood with different moisture contents; tangential and radial shrinkage for veneers of different thickness (sap and heart); mechanical strength, limit of proportionality and modulus of elasticity in tensile tests.

1012. FEDOROWICZ, Z., and STARKIEWICZ, H. Niektóre fizyczne i mechaniczne własności płyt stolarskich wykonanych z odpadów fornirowych w porównaniu z własnościami płyt stolarskich listewkowych. **[Some physical and mechanical properties of laminboards made from veneer waste compared with those of blockboards.]** *Prace Inst. Tech. Drewna* 2 (1), 1955 (54–71). [Pol.pol.russ.e.] P.R.

Comparative tests were carried out with laminboards 13, 25 or 36 mm. thick, with cores made of veneer-waste strips 1·5 or 3·5 mm. thick (*A*) and blockboards of the same thicknesses (*B*) as follows: (*a*) bending strength as a function of moisture content (m.c.); (*b*) compression strength as a function of m.c.; (*c*) density variation during humidification and drying; (*d*) swelling and shrinkage during humidification and drying. No essential differences were found between (*A*) and (*B*); (*a*) was slightly lower for (*A*) than for (*B*), but (*b*) (particularly for thinner boards made of 3·5-mm. veneer waste) was higher for (*A*) than for (*B*).

1013. **Lead Plymax: Venesta plywood used in obtaining X-ray protection.** *Timb. Tr. J.* 218 (4167), 1956 (85).

A booklet has been issued by Venesta Ltd., Queen Street Place, London, E.C.4, with instructions on the use, for the construction of X-ray rooms, of Lead Plymax. This consists of high-quality lead sheet of various thickness, cemented between 2 sheets of ¼-in. plywood. Panels, battens and other accessories are supplied to suit site measurements.

832.8. Integrated Mills and Combinations of Mills

See also No. 840.

1014. SCHWIERTZ, H. F. **The integration of forest products and processing. A proposition for the**

economic use of second-class tropical species. *Wood* 21 (8), 1956 (317–9).

A scheme is outlined for a unit taking 20,000 tons of logs/year and producing 600–1000 prefabricated houses with their furniture (plans suitable for SE Asia given), sawn timber, plywood and/or veneer, fibre- and chipboard, and even pulp, paper and plastics, with an annual turnover of about £1,000,000.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

1015. WINTER, H. Bibliographie der Veröffentlichungen über den Leichtbau und seine Randgebiete im deutschen und ausländischen Schrifttum aus den Jahren 1940 bis 1954. **[Bibliography of German and foreign literature on light-weight construction and allied subjects, 1940 to 1954.]** Verlag Springer, Berlin. 1955. pp. 1003. [G.E.] Price *DM*.80·00. From *review* in *Holz-Zbl.* 82 (110), 1956 (1347). [G.]

Contains, among its total of ca. 20,000 titles, numerous references to construction with, and uses of, woods, plywoods, composite materials made wholly or partly of wood, and glues, in building, vehicle building etc., and their strength properties.

833.1. Building Components and Fittings: General

See also No. 1040.

1016. REID, J. S. **New Zealand building timbers (how, where, and when to use them).** New Zealand Forest Service, Wellington. [1956?] pp. 71 + 14 photos. 30 refs.

Includes tabulated data on physical and mechanical properties, durability, seasoning properties etc. of a number of New Zealand species, and information on their use in building components.

1017. L'emploi du contreplaqué pour le coffrage du béton. **[Use of plywood for concrete shutterings.]** *Cah. Centre tech. Bois* No. 8, 1954. pp. 11. [F.] P.R.

Describes grades and sizes of plywood for shuttering used in France, and their use and maintenance.

1018. GRINDROD, J. **New method of [concrete] shuttering in Holland.** *B.C. Lumberm.* 40 (8), 1956 (110, 112).

The 'majorca mat' can be used up to 30 times, requires no sawing or nailing, and results in an 80% saving on the conventional type. The mats consist of 2 × 1-in. laths chamfered on the underside edges for flexibility and threaded on nylon cords. Adjustments to cover the shuttered area are made by varying lath length and adding one lath of suitable width if required. The manufacturers of these patents are Nederlandse Majorca Beton Matten Industrie, The Hague, Holland.

1019. GIORDANO, G. Les grands cintres Cruciani. **[Large Cruciani arches.]** *Rev. Bois Appl.* 11 (6), 1956 (7–10) [F.]

Illustrated description of a patented method of erecting arches (to support concrete formwork) assembled from boards (Spruce preferably), 15–25 mm. thick, as laminae held together by shackles. For small spans and heights 'solid' arches can be used; for larger spans and heights a lattice construction is used, the main laminated members being strutted with diagonals of solid wood, e.g. Poplar.

1020. **Laminated timber arch design.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (19–20 + 1 photo).

Tests were made on two arches (a semi-circular one of 40-ft., and a parabolic one of 30-ft. span) made of *Pinus sylvestris* bonded with a cold-setting urea-formaldehyde resin. Both arches performed satisfactorily.

1021. CHURCHMAN, H. **Wood lamella.** *Wood* 21 (7; 8), 1956 (268–71; 307–10).

Notes on the applications, construction, covering and decoration of lamella roofs carrying large clear spans without trusses. The second part deals with the forces, mesh dimension and lamella section, joint design and general arrangement.

1022. **W-type roof trusses—why are they better than joist-and-rafter framing?** *Repr.* from *Wood Construction and Building Materialist, Xenia, Ohio* May, 1956. pp. 2. P.R.

According to Madison tests, typical W-type house trusses carry test loads far above design requirements set in building codes, make possible 'open' room planning, are easy to fabricate and can be installed rapidly.

833.2. Special Uses in Residential, Commercial and Public Buildings

1023. **Making log cabins endure. Suggestions on preservatives, chinking, and finishes.** *Rep. U.S. For. Prod. Lab., Madison* No. 982 (rev.) 1956. pp. 12. 11 refs. P.R.

833.3. Special Uses in Factories and Workplaces

1024. CROW, G. B., and REECE, P. O. **A timber storage shed.** *Wood* 21 (9), 1956 (342–8).

A detailed description of a new shed at Shoreham Sussex, embodying a new structural design and function and based on a module of 40 in.

833.8. Wood in Hydraulic, River and Marine Uses

See Nos. 1040, 1045.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 739, 1050.

1025. TINTO, J. C. Estudio de los caracteres fisicomecánicos y organolépticos en maderas para tonelería. **[Physical, mechanical and tainting properties of cooperage woods.]** *An. Adm. nac. Bosques, B. Aires* 1956 (19–30). [Span.]

Discusses the characteristics necessary in woods used for cooperage and lists suitable species (some Argentine and some foreign) with data on their mechanical properties.

1026. KONDRAŠKIN, E. P., and TEMKINA, R. Z. Zalivnye bočki iz kleenoĭ drevesiny. **[Barrels for**

liquids from glued wood.] *Derev. Prom.* 4 (1), 1955 (10–2). 4 refs. [Russ.] P.O.

Describes barrels of 100 litres (for the transport and storage of fish) made of 16-mm., 8- to 9-ply, laminates (for staves) and plywood (for bottoms), prepared from 2·6–3 mm. Birch, Lime, Aspen or other veneer, using a special SBT glue. The manufacture, properties and cost of the barrels are described and tabulated.

1027. BIELCZYK, S. **Remarks on the methods of investigating the resistance of wood packings.** *Transl. For. Prod. Lab. Can.* No. 100, 1956. pp. 13. 5 refs. Transl. from *Sylwan* 98 (4), 1954 (332–44). [See *F.A.* 16 No. 3485.] Limited distribution.

1028. Deutsche Kistenindustrie in hartem Konkurrenzkampf. [**The German box industry meets stiff competition.**] *Holz-Kurier, Wien* 11 (23), 1956 (1–4). [G.]

A description of modern trends in box and wooden packing manufacture, describing lightweight collapsible plywood boxes, wire-bound boxes, pallets for stacking, and a 'packing-by-the-yard', consisting of thin narrow sheets mounted on a paper or fabric backing. This product is used, e.g. with head boards of plywood, wood, or fibreboard, to make containers for the retail sale of coal, where it serves at the same time as kindling.

1029. ASKARI, M. **Plywood cabin trunk.** *Indian For.* 82 (6), 1956 (322–3 + dgm.).

Description, with scale plans and costs, of a cabin trunk of plywood designed at the Forest Research Institute, Dehra Dun.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also No. 1054.

1030. REHMAN, M. A., and ASKARI, M. **Indian woods for textile mill accessories. Part III. Jute mill bobbins with 3-ply ends (evolved at the F.R.I.).** *Indian For.* 82 (6), 1956 (314–9 + 1 dgm.).

The main defect in the jute-mill rove bobbins made of Mango (*Mangifera indica*), Haldu (*Adina cordifolia*), and Kalam (*Stephegyne parvifolia*), the most commonly used Indian timbers for this type of bobbin, is the brittleness of the ends. One remedy, viz. the use of multi-ply ends, would require elaborate plywood-making machinery. In order to get over this difficulty an improved type of bobbin with 3-ply ends (for which several second-class woods can be used) has been developed by the Forest Research Institute, Dehra Dun. Manufacturing details and the results of service tests are described. These bobbins have been found very satisfactory, and most of the big bobbin makers have switched to this type of construction. Even in bobbins of smaller sizes, the new type is now preferred by most bobbin makers. *From authors' summary.*

1031. REHMAN, M. A., and ASKARI, M. **Indian woods for textile mill accessories. Part IV. Indian timbers for picker arms.** *Indian For.* 82 (7), 1956 (378–81).

Gives the results of service tests carried out in several cotton mills on picker arms made of Indian woods. It has been found that *Grewia tiliaefolia* gives as good a life as imported Hickory. *Anogeissus latifolia, Acacia arabica, Lagerstroemia parviflora, Diospyros melanoxylon* and *Ougeinia dalbergioides* can also be used satisfactorily for this purpose.

1032. PAVLOV, V. P. Ispytanija massivnyh lyž iz mančžurskogo jasenja. [**Tests of solid wood skis made of *Fraxinus mandshurica*.**] *Derev. Prom.* 5 (2), 1956 (17). [Russ.russ.] P.R.

In use, skis made of this wood have a small % of breakage (ca. 5%); most breakages occur in wood with narrow growth rings (12 and more rings/cm.).

1033. NEĬFAK, E. V. O tehnologii proizvodstva kleenyh lyž. [**Manufacture of glued skis.**] *Derev. Prom.* 4 (12), 1955 (3–7). [Russ.] P.R.

Describes the seasoning of the wood, preparation of glues, composition of multi-layer skis (species), gluing, pressing and finishing.

1034. SIMMONDS, N. W. **Fishing rod botany; a review.** *Kew Bull.* 1956 (1), (135–40). 19 refs.

An annotated list of species used for rods, including *Arundinaria amabilis* var. *sativa, Bambusa tulda, Dendrocalamus strictus, A. japonica* (*Bambusa metake*), *Phyllostachys mitis* and *P. aurea, Arundo donax*, Palms, *Ocotea rodiei*, and miscellaneous other species.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See also No. 981.

1035. MORUŠKIN, G. V. Fanerovanie mebeli luščenym šponom iz svilevatoĭ berezy. [**Veneering furniture with rotary veneer from Birch with wavy grain.**] *Derev. Prom.* 4 (12), 1955 (22–4). [Russ.] P.R.

In one Leningrad furniture factory only Birch with the most wavy grain (wave length 8–30 mm.) is used as decorative veneer, at thicknesses between 0·8 and 1·15 mm. Veneers with very thin (capillary) cracks on the back side are rejected. The moisture content should not exceed 8–10%. The utilization % of wavy Birch veneer averages 10–15% higher than that of Oak veneer. Best results are obtained with urea resin glues.

838. Vehicles (including Ships, Boats, Aircraft)

See also No. 1136.

1036. MILES, W. H., and KUENZEL, J. G. **Gluing developments related to the Navy's shipbuilding program.** *For. Prod. J.* 6 (6), 1956 (213–5). 7 refs.

Outlines recent progress and future lines of research in the use of laminated wood in shipbuilding, including plastic impregnation of laminates.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 358, 365–6, 487–8, 984, 993, 1002.

1037. VORREITER, L. **Fundamental properties of sawdust.** *Transl. Commonw. sci. industr. Res. Organ.*

Aust. No. 2794, 1955. pp. 9 + 1 photo, 3 gphs., 1 tbl. Transl. by M. Slade from *Holz-Zbl.* 79 (105), 1953 (1127–8). [See *F.A.* 15 No. 4213.] P.R.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

1038. FLEMMICH, C. O. [Editor]. **Destructive agencies of timber.** *Malay. For.* 19 (3), 1956 (139–53).

A chapter from the revised version of *Timber Utilisation in Malaya* (1940) which it is hoped to publish early in 1957, covering fungi, insects, marine borers, fire, and weathering.

841. Wood Preservation

See also Nos. 1023, 1057.

1039. **List of publications on wood preservation.** *Rep. U.S. For. Prod. Lab., Madison* No. 704 (rev.) 1956. pp. 22. P.R.

1040. **Aspects of wood preservation. Extracts from papers read at the annual convention of the British Wood Preserving Association held at Cambridge.** *Wood* 21 (7), 1956 (272–5).

Contains extracts from the following papers: The use of timber in the construction of sea defence and river work (*K. E. Cotton*); Timber preservation and the architect (*C. S. Mardall*); The ambrosia beetle problem and log protection in West Africa (*W. E. Webb* and *T. Jones*); Investigations on the Oak pinhole borer: a progress report (*J. M. Baker*); The contribution of wall linings to the growth of fire (*P. H. Thomas*); Termites destructive of timber (*W. V. Harris*).

1041. SILBERNAGEL, H. Zur qualitativen und quantitativen Analyse von fluorhaltigen Holzschutzmitteln(U- und UA-Salze). **[Qualitative and quantitative analysis of fluorine-containing wood preservatives (U and UA salts).]** *Mitt. öst. Ges. Holzforsch.* 8 (3), 1956 (36–8). 8 refs. [G.g.] P.R.

Methods are described for detecting and determining F, chromates, arsenates, dinitrophenol and wetting agents, and results of typical analyses are tabulated.

1042. **Report of Committee D-7 on wood.** *Prepr. Proc. Amer. Soc. Test. Mater.* No. 38, 1956. pp. 20. 8 refs. P.R.

Includes the proposed tentative method of testing wood preservatives by laboratory soil-block cultures.

1043. SNOKE, L. R. **Specific studies on the soil-block procedure for bioassay of wood preservatives.** *Applied Microbiology, Baltimore* 4 (1), 1956 (21–30). 11 refs. L.S.

Of the 4 studies reported, the first concerns the development of a new, objective, statistical method of determining the total inhibition point of a preservative; the second revealed that for creosote such points were not markedly different for oven-dry test blocks (¾-in. cubes of Pine sapwood) or blocks conditioned to ca. 11% m.c.; the third gave higher inhibition points for two creosotes in flasks with vented caps than in flasks with loose screw-caps; and the fourth, a comparative test with whole or sectioned blocks, indicated that the distribution of creosote, using the full-cell process and toluene dilution, is uniform throughout the test sample. [Cf. *F.A.* 15 No. 4222.]

1044. BELLMANN, H. Praktische Erfahrungen und wissenschaftliche Erkenntnisse der Teerölimprägnierung von Leitungsmasten. **[Practical experience and theoretical foundations of the impregnation of transmission poles with creosote.]** *SchrReihe öst. Ges. Holzforsch.* No. 6, 1956. pp. 43. 117 refs. [G.g.] P.R.

Discusses recent results obtained in the following fields: (1) composition and toxic effect of total oils and single fractions; (2) impregnation of Pine and Spruce with creosote; and (3) behaviour of the poles after impregnation and in service.

1045. **New lease of life for untreated timber piling in service.** *Railway Track and Structures, Chicago* 51 (9), 1955 (48–9). P.O.

A process used on the Northern Pacific for arresting decay in the timber piling of bridges (mostly Western Red Cedar) is described. The extent of heart rot is first determined by sample borer. If the pile is still in satisfactory condition, earth is excavated round it to a depth of 2 ft. All decayed wood is scraped off and the exposed surface cleaned with a wire brush. Osmoplastic (containing NaF, dinitrophenol and $K_2Cr_2O_7$ suspended with mineral fibres in a gelatinous coal-tar base) is applied with a brush up to 6 in. above ground. The surface is then covered with a single layer of stout, waterproof, plastic-surfaced Osmo Shield paper, held by 1-in. galvanized roofing nails down the overlap and round the top edge. Before refilling the hole, any pieces of decayed wood that have fallen into it must be carefully removed.

1046. ROGALIŃSKI, K., GIECEWICZOWA, P., and LECHNA, I. Badania nad zabezpieczeniem parowanej tarcicy bukowej przed grzybami ze specjalnym uwzględnieniem pleśni. **[Research on the preservation of steamed sawn Beech against fungi, with special reference to moulds.]** *Prace Inst. Tech. Drewna* 2 (1), 1955 (31–53). 11 refs. [Pol.pol.russ.e.] P.R.

Laboratory and semi-industrial tests on sawn Beech stored after steaming and treated (by cold or cold-and-hot dipping) with (*a*) DNP, DNC, 'Fluralsil', (a $ZnSiF_6$ preparation), NaF, $Na_2B_4O_7$, Na_2SiF_6, Na_2CO_3 and $Na_2S_2O_3$ in laboratory tests, and (*b*) 0·5% DNP, 4% NaF, and 5% Fluralsil in semi-industrial tests, showed that 0·5% DNP (and 0·5% DNC in laboratory tests) gave the best results, preventing mould formation in laboratory tests and reducing mould growth to negligible proportions in semi-industrial tests. Less effective was 4% NaF; all the others proved ineffective. Additional tests showed that *Polystictus versicolor* and *Coniophora cerebella* did not grow in wood treated with 0·5% DNP or DNC, 4% NaF or 5% Fluralsil. Cold-and-hot dipping gave better results than cold dipping alone.

1047. BLEW, J. O. **Treating wood in pentachlorophenol solutions by the cold-soaking method.** *Rep. U.S. For. Prod. Lab., Madison* No. 1445 (rev.) 1956. pp. 9 + 1 dgm., 1 gph., 2 tbls. P.R. [Cf. *F.A.* 7 No. 1322.]

1048. AMEMIYA, S. **[Preservation of wood by the diffusion process. (III). The penetrating test of a few preservatives on the sapwood of Sugi, Akamatu, and Karamatu with various moisture contents. (IV). The penetrating test of a preservative on the round timbers of Akamatu and Karamatu.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 82, 1955 (45–56). 8 refs. [Jap.jap.e.]

(III) A graph shows the radial penetration in (*a*) *Cryptomeria japonica*, (*b*) *Pinus densiflora*, (*c*) *Larix leptolepis* of 25–100% initial moisture content (m.c.) 5 weeks after brush treatment with 3 osmotic salts. To obtain > 20 mm. penetration in this period, the initial m.c. of (*a*) and (*c*) should be at least 40–50% and that of (*b*) ca. 60%. Above 50% m.c. the sap- and heartwood of (*a*) were penetrated to an equal depth.

(IV) Six-foot lengths of poles of *P. densiflora* and *L. leptolepis* were brush-treated with Malenit and then stored in a room (27° C., 70% r.h.), one half being covered with vinyl sheet. The Larch was barked for half its circumference before treatment. Results are tabulated. Penetration under the vinyl sheet passed the heartwood margin in larger, and reached its centre in smaller, timber, but was < 10 mm. in the uncovered timber. Bark, if thin, does not impede penetration.

1049. BURGESS, H. J. **Termination of an experiment on the durability of pressure-creosoted Keruing fence posts.** *Malay. For.* 19 (3), 1956 (165).

It is concluded that a fence of pressure-creosoted posts of *Dipterocarpus* spp. [*D. baudii*, *D. verrucosus*, and *D. sublamellatus*] would have a life of 25 years in Malayan conditions.

1050. KURTENACKER, R. S., SCHEFFER, T. C., and BLEW, J. O. **Condition of preservative treated field boxes after 5 years of outdoor exposure. (Report on the protection provided by certain applications to wooden field containers for produce.)** *Rep. U.S. For. Prod. Lab., Madison* No. 2054, 1956. pp. 8 + 3 photos, 4 tbls. P.R.

Best decay control was afforded by: ammoniacal Cu arsenite (0·27 lb./cu. ft.) applied by pressure; Ni-As-dichromate mixture (0·21 lb./cu.ft.), pressure; ammoniacal Cu arsenite (3·17%), dipping, and Cu naphthenate (1% Cu), dipping. Six other preservative mixtures were found promising. Water repellency persisted, after suitable treatment, for 2 years. Better strength values were found for boxes treated with a water-borne preservative or with a preservative containing a water-repellent ingredient than for boxes with other preservatives and for controls.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

See also Nos. 941, 1010, 1036.

1051. NEDBAL, F., and HOLUBEKOVÁ, A. Rozbor vlastností plného zhouštěného dřeva Bukolis. **[The properties of 'Bukolis' solid compressed wood.]** *Dřevo* 11 (3), 1956 (62–5). 6 refs. [Cz.cz.g.] P.R.

Presents the results of tests on 'Bukolis' [compressed Beech; method of manufacture not given]. Its physical and mechanical properties are roughly the same as those of Lignostone of the same density, and exceed those of natural Beech by ca. 30%.

1052. SAMEK, J. Technologie výroby vrstveného lisovaného dřeva. **[Technology of manufacture of compressed [improved] wood with a layered structure.]** *Dřevo* 11 (3), 1956 (66–8). [Cz.cz.g.] P.R.

Describes the manufacturing processes used in Czechoslovakia for obtaining improved wood from laminates and from plies with phenolic resins. The species used are Birch, Beech, Poplar, Alder, and Sycamore Maple; the thickness range is 0·3–2·5 mm. The greater part of the article deals with the manufacture of improved wood from resin-impregnated veneers; gluing by means of resin coatings or resin films is also briefly described. The main factors affecting the properties of the final products are species and thickness of veneer used, relative arrangement of neighbouring veneers (grain direction), pressure, and nature of resin and resin content.

1053. SAMEK, J. Vlastnosti vrstveného lisovaného dřeva. **[Properties of compressed [improved] layered wood.]** *Dřevo* 11 (5), 1956 (117–22). 14 refs. [Cz.cz.] P.R.

According to Czechoslovak standards, compressed layered wood can be of 3 types: (1) all layers parallel, i.e. the angle between the grain in adjacent layers ⩾ 15°; (2) cross-banded, i.e. angle between the grain of adjacent layers at 90°, and (3) a 'star-shaped' arrangement, successive layers having their grain always at a constant angle (usually 45°) to the grain of adjacent layers, all in a clockwise or anti-clockwise succession. The same standard (*CSN* 492,611) contains a table of densities and mechanical properties of non-densified and densified wood of the above three types, and for wood impregnated and non-impregnated with resin for 3 thicknesses of layer. Results of an investigation on the water absorption and swelling of non-densified non-impregnated layered wood, and of non-densified and densified resin-impregnated wood made of layers of different thickness are given. Results of tests on the mechanical and electrical properties of compressed wood made of layers of Beech (1·0 or 0·3 mm. thick) or of Poplar 0·8 mm. thick are tabulated; also information on the workability (tool geometry, cutting speed, feed rate, depth of cut, service life, maximum blunting) of compressed layered wood.

1054. ŠEĬDIN, I. A. O tehnologii izgotovlenija podšipnikov iz drevesnosloistyh plastikov. **[Manufacture of bearings from improved laminwood.]** *Derev. Prom.* 5 (2), 1956 (14–5). [Russ.] P.R.

To obtain improved laminwood impregnated with oil, ⅔ of the veneer sheets are impregnated with synthetic resin, and the rest are first impregnated with mineral oil and then with resin; the whole is then compressed to form panels 120 × 100 cm. and 55 mm. thick. This improved wood, prepared from Birch veneer 0·55 mm. thick, had the following mean properties: tensile strength, 2780; compression

strength, 1524; static bending, 2180; impact bending, 70; shear, 205 kg./sq. cm.; hardness (Brinell) 26 kg./sq. mm.; density, 1·28 g./c.c.; water uptake (24 hours), 7·4%; maximum water uptake, 27%; maximum swelling, 23%. Friction tests have shown that the new materials are suitable for friction elements where lubrication is difficult, and where the specific load is $\geq$ 15–20 kg./sq. cm. and the sliding speed $<$ 1 m./sec.

1055. YAMAGISHI, Y. **[Water repellency, water absorption and moisture adsorption of wood treated with synthetic organosilicone compounds.]** *J. Jap. Wood Res. Soc.* 2 (1), 1956 (36–42). 7 refs. [Jap.e.] P.R.

Wood test-pieces were coated with solutions of organosiloxanes in ligroin, or were treated with organohalosiloxane vapour, after which their water repellency, water absorption and water-vapour adsorption were determined. A method is described of determining the water repellency in terms of the angle of inclination of the test surface at which a compound drop of water (2–7 single drops) just begins to flow; the smaller that angle the greater is the water repellency. Absorption of water diminished and water repellency increased as the proportion of the treating substance increased; no similar effect was observed for the adsorption of water vapour.

843. Fireproofing and Fire Resistance

See No. 1040.

844. Attack by Plant Organisms

844.1. Sap-staining and Mould Fungi

See Nos. 673, 1046.

844.2. Wood-destroying Fungi

See also Nos. 438, 1046, 1106, 1145.

1056. WILSON, I. M. **Some marine fungi on wood.** *Abstr.* in *Trans. Brit. mycol. Soc.* 39 (3), 1956 (386). O.B.D.

Describes fungi imperfecti collected from wood blocks placed at various tide levels on the shore at Aberystwyth. All the species described soften the surface layers of the wood and aid its erosion by the sea. They are succeeded by marine crustacean borers.

1057. **[Effect of dilute fluoride solutions on wood decay.]** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (33).

Blocks impregnated with NaF and then leached out (but still containing minute quantities of NaF) and exposed to *Coniophora cerebella* suffered a significantly greater loss in weight than controls. Further tests are being carried out to confirm this stimulation of decay.

1058. LYR, H. Vorkommen von Peroxydase bei holzzerstörenden Basidiomyceten (Vorläufige Mitteilung). **[Occurrence of peroxidases in wood-destroying basidiomycetes. (Preliminary report).]** *Planta* 46 (4), 1955 (408–13). Many refs. [G.] O.B.D.

The following species were found to form peroxidases on certain substrata: *Inonotus* (*Polystictus*) *radiatus*, *I.* (*Polyporus*) *hispidus*, *Phellinus* (*Fomes*) *igniarius*, *P. igniarius* subsp. *pomaceus*, *P.* (*Trametes*) *pini*, *P.* (*Fomes*) *robustus*, *Polystictus tomentosus*, *P. tomentosus* f. *circinatus*, *Stereum* sp. and *Nematoloma* (*Hypholoma*) *sublateritium*. It is noteworthy that these are almost exclusively fungi attacking heartwood—chiefly of Pine and Oak.

1059. HIGUCHI, T., KAWAMURA, I., and HAYASHI, I. **[Biochemical study of wood-rotting fungi. V. The enzymatic oxidation of lignin.]** *J. Jap. Wood Res. Soc.* 2 (1), 1956 (31–5). 10 refs. [Jap.e.] P.R.

[Cf. *F.A.* 15 No. 2997.] The effect on lignins of the laccases of Japan lac and the wild mushroom *Lactarius piperatus* was examined in order to establish whether the O consumption by lignins in the presence of the culture filtrate of *Polystictus versicolor* was due to laccase or other enzyme. Experiments with concentrated enzyme solutions brought about a slight O consumption, attributable to the oxidation of free phenolic groups. The occurrence of many aromatic aldehydes and acids in Beech wood-flour attacked by white-rot fungi cannot be explained as due to lignin oxidation being catalysed by the laccase in culture filtrates. Lignins, and aromatic aldehydes and acids mentioned above, were readily oxidized by 2 strains of *Pseudomonas fluorescens*, the oxidation being inhibited by NaN_3, 8-hydroxyquinoline and salicylaldoxime.

1060. YOKOTA, S. **Comparative activities degrading cellulosic substances by wood-rotting fungi.** *Bull. Tokyo Univ. For.* No. 50, 1955 (37–44). 9 refs. [E.e.jap.]

A laboratory study comparing the activity of 10 species of white and 9 of brown rots in the enzymic hydrolysis of cellulose in artificial substrates. Under the experimental conditions, the white rots were more active in the initial reaction (cellulose to polysaccharides) and the brown rots in the second stage (polysaccharides to cellobiose). [Cf. *F.A.* 15 No. 2993.]

1061. JURÁŠEK, L. Změny v mikrostruktuře zdřevnatělé buněčné blány při rozkladu dřevokaznými houbami. **[Changes in the microstructure of the lignified cell wall during attack by wood-decaying fungi.]** *Repr.* from *Biológia* [*Czechoslovakia*] 10 (5), 1955 (569–79). 16 refs. [Cz.cz.russ.g.] P.R.

Microscopic and histochemical investigations of changes produced in Spruce wood by brown rot and white rot (pure culture of *Panus stipticus*) have shown that: (1) In brown rot, decay begins in the middle layer of the secondary wall, creating oblong cavities parallel to cellulose fibrils; in the next stage the inner layer of the secondary wall and the compound middle lamella undergo decomposition. The author believes that the tertiary wall is lignified in just the same way as the primary wall. (2) In white rot, the decay begins with the delignification of the inner layer of the secondary wall, and the delignification, accompanied by cell-wall swelling, spreads from the lumen to the primary wall. When the whole of the secondary wall has been delignified, the cells are loosened by delignification of the middle lamella.

1062. JURÁŠEK, L., and RYPÁČEK, V. Vznik a funkce tmavých zon ve dřevě. **[Origin and function of dark zones in wood.]** *Repr.* from *Přírodovědecký Sborník Ostravského Kraje, Opava* 15 (2/3), 1954 (320–32 + 8 photos). 10 refs. [Cz.cz.russ.e.] P.R.

Dark lines appearing in natural wood (Beech stumps), or in Spruce inoculated *in vitro* with pure cultures of decay fungi, were examined microscopically and histochemically. Cell lumina in these dark zones are filled with structures resembling pseudo-sclerotia; they are brown, pass into the normal mycelium on the zone boundaries, and in suitable conditions can produce fungal hyphae. The cell membranes are strongly chitinized, which explains their chemical resistance. The dark zones separate two parts of the wood differing greatly in moisture content, the inner having a higher m.c. Similar zones develop when pure cultures (e.g. *Stereum hirsutum*) are cultivated in Pine sawdust. They help to maintain the optimum m.c. for fungal growth in a certain wood layer.

1063. KIŠPATIĆ, J. Otpornost smeđe srži poljskog jasena prema gljivama. **[Resistance to fungi of brown heartwood in *Fraxinus angustifolia*.]** *Šum. List* 79 (11/12), 1955 (587–603). 13 refs. [Croat.g.]

Tests were made on sapwood and brown heartwood of *F. angustifolia* with the fungi *Polyporus adustus*, *P. hispidus*, *Polystictus versicolor*, *Pholiota squarrosa*, *Coniophora cerebella* and *Daldinia concentrica*. The brown heartwood is, in general, more resistant to fungal attack than sapwood. *Polystictus versicolor* was found to cause the most rapid decay, even more so than the fungi usually found in living Ash trees. The wood of trees without brown heart is more readily attacked than the sapwood of trees with brown heart.

1064. SHIMAZONO, H., and MATSUOKA, S. **[Variation of the moisture content and loss in weight of wood in the decay-resistance test.]** *J. Jap. Wood Res. Soc.* 2 (2), 1956 (69–72). 8 refs. [Jap.e.] P.R.

Moisture content (m.c.) and loss in weight were determined for 2 × 2 × 2 cm. samples of sapwood of *Fagus crenata*, *Cryptomeria japonica* and *Pinus densiflora* 10, 20, 30, 45, 60, 90, 120, 150 and 180 days after inoculation with *Poria vaporaria* or *Polystictus versicolor*. The m.c. increased suddenly ca. 10 days after the onset of fungal attack, but no appreciable change was observed later. The rate of weight loss was first small, then suddenly increased and finally decreased slowly, the maximum being reached for *P. vaporaria* (and for the other fungus on *F. crenata*) after 20–30 days, and for *P. versicolor* on *C. japonica* and *P. densiflora* ca. 2 months later.

1065. HAYASHI, K. **Hydrature studies on fungi. II. Forest fungi.** *Japanese Journal of Botany, Tokyo* 14 (1), 1953 (91–8). 20 refs. [E.e.] C.G.B.

Discusses results of studies on 8 fungi, including *Merulius lacrymans*, *Poria cocos*, *Polystictus versicolor*, *Fomes connatus* and *Lenzites betulina* to determine the effect of pH, relative humidity and temperature on growth of mycelia in culture.

1066. DILLER, J. D., and KOCH, E. J. **Further results on the relative durability of 40 wood species to 'house decay' fungi.** *Abstr.* in *Phytopathology* 46 (8), 1956 (467). 1 ref.

[Cf. *F.A.* 16 No. 1126.] After 2 years' active attack by *Merulius lacrymans* and *Poria incrassata* (the former being the more destructive) the most resistant of the 40 species (7268 test blocks) were Osage-Orange [*Maclura pomifera*], Japanese Chestnut, and American Smoketree [*Cotinus obovatus*]. The least resistant were Eastern and Western Hemlock and Douglas Fir.

1067. DILLER, J. D., and HUANG, S. W. **Further results on the vertical advance of two 'house decay' fungi in artificially infested timbers.** *Abstr.* in *Phytopathology* 46 (8), 1956 (467). 1 ref.

[Cf. *F.A.* 16 No. 1127.] In 4 years the average advance of *Merulius lacrymans* in Pine, Oak and Douglas Fir, was 5·5, 4·9 and 4·7 ft. respectively; corresponding figures for *Poria incrassata* were 5·1, 3·9 and 5·1 ft.

1068. BÁLINT, G. Beépített faanyagok korhadása és védelme. **[Dry rot and timber protection in buildings.]** Mezögazdasági Kiadó, Budapest. 1956. pp. 238. 82 refs. [Hu.] Price *Forint* 21 unbound (*Forint* 26 bound). P.R.

1069. **Temperatures necessary to kill fungi in wood.** *Tech. Note U.S. For. Prod. Lab., Madison* No. 259, 1956. pp. 3. 3 refs. P.R.

Presents in tables the results of tests with 3–6 fungus species, the wood being always kept above the fibre saturation point during the heating. The minimum sterilization temperature should be 150° F.

845. Attack by Animals

845.1. Marine Borers

See also No. 1040.

1070. BECKER, G., and KAMPF, W. D. Die Holzbohrasseln der Gattung *Limnoria* (Isopoda) und ihre Lebensweise, Entwicklung und Umweltabhängigkeit. **[Marine wood-boring isopods of the genus *Limnoria*, their habits, development and ecology.]** *Zeitschrift für angewandte Zoologie, Berlin* 42, 1955 (477–517). 136 refs. [G.g.] L.S.

A review, including information on anatomy and physiology, development and propagation, habits and habitat; the influence of temperature, salt and O content, pH, purity, movement and depth of water; damage to wood and resistance of timber species, with brief notes on taxonomy (mentioning 8 spp.) and distribution. Protection and preservatives will be dealt with separately.

845.2. Terrestrial Borers

See also Nos. 672–3, 1040.

1071. **Defects caused by ambrosia (pinhole borer) beetles.** *Leafl. For. Prod. Res., Lond.* No. 50, 1956. pp. 10.

Supersedes *Leafl. For. Prod. Res. Lab.* No. 17 [see *F.A.* 3 p. 223].

1072. DUFFY, E. A. J. **Recent observations on infestation of an unusual type of ambrosia (pinhole borer) beetle damage in Wawa (*Triplochiton scleroxylon*).** *Emp. For. Rev.* 35 (2), 1956 (198–200). 1 ref.

The author, on a recent visit to West Africa, was able to throw some light on the infestation of Wawa logs apparently otherwise in perfectly sound condition. He attributes the trouble to a platypodid beetle (*Symmerus tuberculatus*) which is widely distributed and reported from the Gold Coast, Nigeria, Togo, Uganda, Kenya and Northern Rhodesia. He lists 7 other woods all well known and mostly timber species, which it also attacks, though not necessarily outside the Gold Coast. The galleries are described as 'lined with a thick deposit of fungus (ambrosia)' and damage is confined to the heartwood. Platypodid damage is usually confined to freshly felled or damaged trees but has been known to occur in healthy standing trees, although this is the only reported instance of attack when the trees are comparatively young. Damage may be negligible and no living beetles or grubs have been found in the timber after conversion nor is reinfestation possible, because the fungus on which it depends could not grow without moisture. *From author's summary.*

1073. **Toxicity of CH_3Br to wood-boring insects.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (40–1).

Larvae of *Sirex juvencus* (of various instars) submitted to a range of dosages of CH_3Br (recorded as concentration/time products) showed 100% kill only when the dosage was 810 mg.-hour/litre. For the eggs of *Xestobium rufovillosum* the 100% kill was at ca. 100 mg.-hour/litre; and nearly the same dosage was required to kill adults of varying ages.

1074. **Sterilization of insect-infested timber by high frequency treatments.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (41–2).

A complete kill of *Lyctus* larvae in Oak sapwood was obtained when the temperature of the wood exceeded 60° C., the exposure period required to reach this temperature ranging from 15 sec. for $1\frac{1}{2}$-in. thickness to 60 sec. for 2-in., using a 250-watt apparatus at 75 megacycles/sec.

1075. **Destruction of wood-boring insects by gamma ray treatments.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (41).

First results are reported of killing, fertility-inhibiting and development-affecting doses of γ rays for egg, larval and adult stages of *Lyctus brunneus*, *Xestobium rufovillosum* and *Anobium punctatum.*

1076. BLETCHLY, J. D. **Some laboratory investigations on the eradication of wood-boring insects by gamma radiation.** *Misc. Publ. For. Prod. Res., Lond.* Misc. I, No. 191, 1956. pp. 6. 7 refs. P.R.

Figures obtained for effective dosages required for the different stages of the life cycle of *Anobium punctatum*, *Xestobium rufovillosum* and *Lyctus brunneus* show that, while this method is not likely to be practical for eradication of insects, lower dosages can sterilize and arrest the development of the adults.

845.3. Termites

See also No. 1040.

1077. SCHMIDT, H. Bemerkungen zur Methodik von Termitenversuchen an Holzerzeugnissen. [**Experimental methods in termite tests of wood products.**] *Z. Weltforstwirt.* 18 (5/6), 1955 (222–4). 9 refs. [G.]

Describes the species of termites employed (mostly *Reticulitermes lucifugus*), the temperature and humidity conditions, and the experimental set-ups used for testing natural wood, plywood, chipboard and fibreboard.

1078. KURIR, A. Europäisches Termitenproblem und internationale Zusammenarbeit. [**The termite problem in Europe and international co-operation.**] [*Docum.*] *12th Congr. int. Union For. Res. Organ.* No. *IUFRO* 56/24/101, 1956. pp. 3. [G.]

Reports the occurrence, and extermination, of *Reticulitermes flavipes* in Hallein (Salzburg), and urges the formation of an international organization for research, prevention, and control.

1079. **New prevention method against white ant attack.** *Aust. Timb. J.* 22 (4), 1956 (349).

Houses can be protected throughout their life by laying in, during construction, a system of $\frac{3}{8}$-in. plastic piping having $\frac{1}{8}$-in. holes at 8-in. intervals. Inlets at floor ventilation vents allow dieldrin solution to be forced in by an ordinary stirrup pump to all vulnerable parts, without danger to the operator and without expert assistance. The operation is repeated at recommended intervals. Cost of installation with Dunlop grey Flexavin tubing is ca. £35–40.

1080. DAVIS, S. H. **Termite proofing injuries to shade trees and shrubs.** *Pest Control* 24 (3), 1956 (51–2). D.S.I.R.

Quotes the case history of a street tree, $\frac{3}{4}$ of which died very suddenly after a house 60 ft. distant was treated with chemicals for termites. The probable mechanism of this effect is given.

847. Drying (Seasoning)

See also No. 880.

1081. **Crossties are seasoned in 18 to 21 days by new process.** *Wood Pres. News* 33 (3), 1955 (8, 31–3). P.R.

Describes the principles of operation of a seasoning plant at Baldwin, Florida, believed to be the only plant in the world combining controlled air seasoning with incising of green sleepers, primarily of Gum [*Nyssa* sp.?] wood.

1082. **Steam requirements in lumber dry kilns.** *Rep. U.S. For. Prod. Lab., Madison* No. 1478 (rev.) 1956. pp. 4. P.R.

The estimated steam consumption for 1-in. lumber in commercial kilns is tabulated for Birch, Maple, Douglas Fir, Longleaf Pine, Oak, Ponderosa Pine, Shortleaf Pine, Sweetgum and Western Hemlock.

1083. **Kiln-drying schedules.** *Leafl. For. Prod. Res., Lond.* No. 42 (rev.) 1956. pp. 15.

Lists some 360 species, giving the kiln-drying schedule recommended for each.

1084. CAMPBELL, G. S. **The drying of Keruing (*Dipterocarpus* spp.).** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 220, 1956 (3–4).

Gives a tentative kiln-drying schedule for Keruing, considerable quantities of which are imported into Australia.

1085. MCMILLEN, J. M. **Seasoning Hickory lumber and handle blanks.** *Hickory Task Force Rep. Stheast. For. Exp. Sta.* No. 4, 1956. pp. 36. 14 refs.

Describes air-drying and kiln-drying procedures on the basis of some 90 kiln runs, including the effect of various schedules on pink discoloration and toughness. Species tested were chiefly *Carya glabra* var. *glabra*, *C. tomentosa*, *C. ovata*, and *C. pallida*. *From author's summary.*

1086. MIKIT, È. A., and UPMANIS, K. K. O režimah suški pilomaterialov v kamernyh sušilkah. **[Kiln seasoning schedules for converted timber.]** *Derev. Prom.* 4 (10), 1955 (10–3). [Russ.] P.R.

The following schedules for seasoning with superheated steam are at present in use in the Latvian S.S.R.: *Coniferous timber 25 mm. thick*—to be dried from 70–80 to 6–7% m.c.: (*a*) preliminary steaming at 100° C. by introducing saturated steam from the boiler into the kiln and radiators, forced circulation at 1–1·5 m./sec., for 5 hr.; (*b*) drying with superheated steam (with or without 5–6% of air) at 115° for 18 hr.; (*c*) cooling, equalization of m.c.; steam is cut off and air gradually let into the kiln, 6–7 hr., the temperature and relative humidity of the air being kept at a level equivalent to the final m.c. of timber plus 2–3%. *Coniferous timber 50 mm. thick*—from 70–80 to 6–7% m.c.: steaming as (*a*), 6 hr.; drying at 112° for 16 hr.; steaming at 100°, radiators switched off, 4 hr.; drying at 112°, 16 hr.; cooling, equalization of m.c., 8 hr. *Coniferous timber 70 mm. thick*—from 70–80 to 6–7% m.c.: steaming 6–7 hr.; drying at 108–110°, 16 hr.; steaming at 100°, 4 hr.; drying at 108–110°, 16 hr.; steaming at 100°, 4 hr.; drying at 108–110°, 16 hr.; cooling, 8 hr. *Birch, Ash or Beech timber, 30 mm.* thick—from 60–70 to 6–7% m.c.: steaming 5–6 hr.; drying at 108°, 18 hr.; steaming at 100°., 4 hr.; drying at 108°, 18 hr.; cooling, 7 hr.

1087. KREČETOV, I. V., and CAREV, B. S. Suška drevesiny peregretym parom. **[Wood seasoning by means of superheated steam.]** *Derev. Prom.* 4 (12), 1955 (9–12). 7 refs. [Russ.russ.] P.R.

Converted Spruce and Pine timber were subjected to experimental seasoning in a kiln with superheated steam (106–116° C.) as the circulating medium, an electric heater with temperature control, and a powerful fan. The drying times were found to average roughly a quarter of those for conventional drying schedules. Temperature differences across the material amounted at first to 5–7°, and then somewhat decreased. The moisture gradients in 6-cm. and 4-cm. material were 10·5 and 5·4% respectively. Seasoning for 46 hours at 111° lowered the impact bending strength by ca. ⅛; seasoning for ca. 27 hours (110° or 116°) by ca. ⅓. Logs 80 cm. long and 18–25 cm. diam. of green Pine, Spruce, Birch, Alder, Lime, Aspen and Oak wood were processed with steam at 100°/99° for 58 hours, followed by 96 hours at 108°/99° (the first figure refers to the dry-bulb, and the second to the wet-bulb reading). All wood species acquired a uniform Walnut-like coloration. Experiments with 6·5-cm. Pine wood dried according to a 'hard' schedule showed a considerable decrease in impact bending strength; the interior was perceptibly darker than the outer layers; it was also more brittle. The 7 references, all Russian (4 are books) deal with seasoning at high temperatures, particularly by means of superheated steam.

1088. KEER, G. A. **Kiln samples [: their selection, preparation and use].** *Wood* 21 (9), 1956 (358–60). 3 refs.

1089. RASMUSSEN, E. F. **Need for uniformity of temperature in a forced-air-circulation, ventilated, compartment dry kiln.** *Rep. U.S. For. Prod. Lab., Madison* No. 1669 (rev.) 1956. pp. 5. P.R.

Points out the need for uniform temperatures, some of the ill effects of non-uniform drying conditions and some of the major causes for non-uniform temperatures.

1090. OGURA, T. **Drop of the dry-bulb temperature during the constant-rate seasoning stage of wood.** *J. Jap. Wood Res. Soc.* 1 (2), 1955 (74–5). [E. jap.] P.R.

Develops theoretically the equation for the temperature drop in the kiln during the constant-rate seasoning stage, and discusses several related problems.

1091. OGURA, T., SUGISHITA, U., and TERAZAWA, S. **[Studies on drying equipment for woods (3). The observation of air current in model naturally ventilated dry kilns by means of the 'Schlieren method'.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 82, 1955 (21–8 + 36 photos). 3 refs. [Jap.jap.e.*e*.]

[Cf. *F.A.* 13 No. 4358.] Illustrated by 36 photographs, 32 of which are of the turbulence produced by various arrangements, the study covers the best position for the vent, the length and shape of the heater and the variation in spacing of the boards for the encouragement of the central upward draught and evenness in ventilation.

1092. IWASITA, M., and TANIBUCHI, M. **[Non-uniformity in internal-fan drying kilns, in particular the effect of the air-velocity distribution.]** *J. Jap. Wood Res. Soc.* 2 (1), 1956 (8–12). 8 refs. [Jap.e.] P.R.

It was found that the air velocity between boards was markedly less at the top of the stack than in other layers. The drop in the wet-bulb depression across the pile was slight with slow-drying woods (e.g. *Quercus serrata*), but considerable in fast-drying woods (e.g. *Cercidiphyllum japonicum*). The drying in the top layers was not very slow in *Q. serrata*, but very slow in *C. japonicum*, and the non-uniformity of moisture content was much greater in the latter. Air-dried *C. japonicum* kiln-dried almost evenly. In order to avoid the effect of non-uniform air

velocity, preliminary air seasoning of fast drying woods is advisable before kiln treatment.

1093. ROZENBERG, M. S., and PUSEP, A. O. Dvuhimpuljsnoe avtomatičeskoe regulirovanie parametrov sušiljnogo agenta. [**An automatic double-impulse control of the parameters of the drying medium.**] *Derev. Prom.* 4 (12), 1955 (7–9). [Russ.] P.R.

Illustrated description of a self-regulating system of maintaining a given air temperature and humidity in a kiln with forced circulation of air and steam heating. The dry- and wet-bulb thermometers are of the differential and electric-contact type. When, e.g. the mercury rises in the dry-bulb thermometer, the relay circuit is closed and actuates the electromagnetic steam valve supplying the steam radiator, so as to reduce the steam supply. The fall of mercury in the wet-bulb thermometer opens the relay circuit, thus actuating a sector shutter which controls the supply of cold-and-dry outside air and that of the warm-and-moist waste air (recirculated); more of the latter is supplied than before, which raises the humidity but also causes a temperature rise (to be counteracted by an additional response of the dry-bulb thermometer).

1094. DAŠKOVSKIĬ, A. F. Avtoreguljator teplovyh processov v sušiljnoĭ kamere. [**Automatic temperature regulator for [steam-heated] kilns.**] *Derev. Prom.* 5 (1), 1956 (17–9). [Russ.] P.R.

Illustrated description of a device embodying dry-bulb and wet-bulb 'thermometers', with CH_3Cl as filling liquid, ending in a spiral tube of the pressure-gauge type. In tests, the device maintained the desired temperature within $\pm$ 1° C.

1095. SUZUKI, Y. [**Shrinkage of wood in kiln drying.**] *J. Jap. Wood Res. Soc.* 2 (1), 1956 (43–8). 2 refs. [Jap.jap.e.] P.R.

Examines the effect of the conditions of drying on the shrinkage of a 28-mm. *Fagus crenata* board. The moisture gradient in the direction of thickness has been shown to be nearly proportional to the rate of drying, in a series of tests at the same temperature, and the value of the drying stress can therefore be expressed relatively in terms of the rate of drying. The permanent set after drying is plotted against the rate of drying, the positive set denoting over-shrinkage of the dried test-piece. Compression stresses in the tangential direction decrease as the drying conditions become more severe, whereas those in the thickness direction (radial), increase. It is believed that some process other than the effect of drying stress due to moisture gradient may bring about a different kind of set, since the dried specimens always showed simultaneous over-shrinkage in both directions of the board.

1096. SUZUKI, Y., and KIKATA, Y. [**Studies on Bamboo (XI). Shrinkage of Bamboo in heat drying.**] *Bull. Tokyo Univ. For.* No. 50, 1955 (117–25). 1 ref. [Jap.jap.e.]

A study of collapse, shrinkage, cupping and reconditioning in pieces of *Phyllostachys pubescens*, 90 × 25 × 2·5 mm., cut from the inner and outer parts of the wall. Drying to 0% m.c., at 100° C., in (*a*) 200, (*b*) 240 min. and (*c*) air drying at 30° to 12·5% m.c. in 4210 min. (3 days) showed the greatest collapse in (*b*). Boiling for 10 or steaming for 25 min. followed by (*a*) was ineffective. Reconditioning by steaming for 30 min. resulted in large recovery from shrinkage and cupping. [Cf. *F.A.* 15 No. 3717.]

1097. **Radio-frequency drying.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (12–3).

RF drying has been found suitable for broomheads of Birch, if the final moisture content is not very low. Promising results have been obtained with RF drying of Beech scantlings and roughly shaped blocks for the manufacture of shoe lasts.

1098. KRUML, J. Vysoušení dřeva v kapalinách. [**Seasoning of wood in liquids.**] *Dřevo* 11 (2), 1956 (47–51). 6 refs. [Cz.g.] P.R.

Trial seasoning of wood in petrolatum [cf. *F.A.* 17 No. 2177] showed that: (1) the method was quicker than conventional seasoning; (2) coniferous sawn timber was impregnated with petrolatum only to a depth of 2 mm., whereas in Beechwood the whole sapwood was impregnated; (3) inner checks and warping were very frequent. The sudden heating when wood is immersed in hot petrolatum (100° C.) and the sudden cooling when it is removed from petrolatum kept at 120–130°, are said to be the chief factors causing this damage. The method is regarded as suitable only for small articles.

1099. **Special methods of seasoning wood. Boiling in oily liquids.** *Rep. U.S. For. Prod. Lab., Madison* No. 1665 (rev.) 1956. pp. 4. Revised by J. M. McMillen. P.R.

1100. SAHNOVSKIĬ, L. V., and KRASNOVSKIĬ, N. V. Konečnaja vlagoobrabotka i kontrolj sostojanija drevesiny posle suški. [**The final moisture conditioning and checking of the condition of wood after seasoning.**] *Derev. Prom.* 5 (1), 1956 (5–8). [Russ.] P.R.

Having checked, in a large number of tests on an industrial scale, the efficacy of Ugolev's recommendations [see *F.A.* 17 No. 3415] using air of 90° C. and relative humidity equivalent to a m.c. 4–6% higher than the final m.c. (i.e. an r.h. of 85–95%), the author found that, under working conditions, the r.h. attained is usually ca. 75% (because of the inadequacy of the humidifying apparatus). Treatment with air at 90° and 75% r.h. was found inadequate to remove excessive stresses. The only feasible working method is to apply colder and very moist air (60–70° and ca. 100% r.h.); this treatment is also much quicker. It was found, e.g. that Pine boards, 19 or 26 mm. thick and 145 mm. wide, lost their residual stresses almost entirely (80–100%) after 2–4 hours of such treatment; the approximate duration of final conditioning of conifers (except Larch) in kilns with forced air circulation is 2, 3, 7, 10 and 17 hours for boards 19, 25, 40, 50 and 60 mm. thick. A table gives the respective times for Birch, Alder, Beech, Larch, Oak and Ash, the conditioning being conducted at a temperature 5–8° higher than that of the final seasoning stage, while the r.h. is equivalent to a m.c.

2–3% higher than the final m.c. of the wood. Methods are described and illustrated for determining the m.c. and m.c. gradient and for estimating the residual stresses in timber specimens.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 490, 1024.

1101. **[I] Timber handling conference. [II] Timber handling equipment.** *Wood* 21 (10), 1956 (382–7, 405–8).

[I] Contains papers on: Site planning (*G. B. Crow*); Choice of equipment (*G. A. B. Storey*); Work study (*J. R. Start*); Ship to yard handling (*P. Grindell*). [II] Notes and illustrations of handling equipment demonstrated in connexion with the Timber Trade Federation Conference.

1102. GRINDROD, J. **Timber handling in Canadian yard.** *Timb. Tr. J.* 218 (4170), 1956 (75–6).

Describes the lay-out, equipment, and working of a new timber yard with the latest fork lift and straddle-carriers set up by the R. Laidlaw Lumber Co. Ltd., Weston, Ontario and costing $2·5 million.

1103. **Machines and equipment.** *Wood* 21 (9), 1956 (366–7).

Includes descriptions of (*a*) the B.H.C. (British Hoist & Crane Co.) hydraulic crane 'Iron Fairy' handling 1- to 2-ton loads, capable of 30 m.p.h. (5–10 m.p.h. loaded), with a telescopic boom enabling it to carry a load through a doorway 9 × 7 ft. 4 in.; (*b*) a self-clamping timber sling (Quiggin & Co.) making possible the safe lifting of loads slung off balance.

85. Grading of Wood and Wood Products

851. Timber Quality in General

1104. RENDLE, B. J. **Variation in the quality of African Mahogany.** *Wood* 21 (9), 1956 (349–54). 1 ref.

Supersedes the relevant part of *Bull. For. Prod. Res., Lond.* No. 18, 1938, and describes the timbers of *Khaya* spp. (4 W. African and one E. African with a distribution map of the former). To obtain more uniform quality, buying should be by species, with due recognition of the importance of locality and natural defects (brittle heart and tension wood).

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 438, 537, 868–70, 1005–6, 1062–3.

1105. **Selecting Ash by inspection.** *Leafl. For. Prod. Res., Lond.* No. 37 (rev.) 1956. pp. 5. P.R. [Cf. *F.A.* 6 p. 171.]

1106. ERTELD, W., and ACHTERBERG, W. Die Bedeutung der Narbenbildung und des Faulkerns bei Roterlenschälholz. **[The importance of occlusion bosses and heart rot in peeler logs of *Alnus glutinosa*.]** *Arch. Forstw.* 4 (7/8), 1955 (611–38). 11 refs. [G.g.]

An examination of *A. glutinosa* peeler logs similar to that already made for Beech [see *F.A.* 17 No. 3422]. The occlusion boss scales are arranged concentrically in an inner and outer 'rose', the former being more easily measurable in the young, the latter in the older bosses. The parabola-shaped corrugation seen in Beech disappears early. The widths of the inner and outer roses, (*a*) and (*b*) respectively, and their heights, (*c*) and (*d*) respectively, the associated depth of occlusion tissue (*e*) and the diameter of occluded branch (*f*) were measured. The best criteria for both (*e*) and (*f*) were (*c*) for the younger bosses and (*d*) for the older bosses; tables for practical use are given. The majority of occluded snags were rotten, the rot increasing with snag diameter but in no case invading the stemwood. Alder peeler logs are at present required to be of minimum top diam. 22 cm. with a 6-cm. width of clear sound sapwood. A provisional table is suggested showing the diam. of admissible centre rot and width of sound sapwood for peeler logs of diameters 20, 25, . . . 50 cm.

1107. PAUL, B. H. **Changes in spiral grain direction in Ponderosa Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2058, 1956. pp. 4 + 2 photos, 1 gph., 1 tbl. P.R.

Measurements of grain angle for successive inches from the pith outwards, made in opposite radii at 3 heights in 80-year-old second-growth stems, showed a reduction in grain angle from the pith outwards, accompanied by an increase in grain angle with height up the stem. At any given height, dominant trees had a larger grain angle than co-dominant and intermediate trees. Reversals of direction of spiral occurred within 17 of the 18 trees on at least one radius. Spiral grain appearing on the stem surface may not be an indication of the degree of spiral throughout the tree. *From author's summary.*

1108. OBERG, J. C., HOSSFELD, R. L., and KAUFERT, F. H. **Fluorescent materials associated with discoloration in Aspen.** *Tappi* 39 (7), 1956 (470–1). 6 refs. P.R.

Extractives from discoloured zones in the wood of *Populus tremuloides* have been shown by paper partition chromatography to include a well defined group of strongly fluorescent compounds. Their nature and composition appear to be independent of the nature of the associated type of injury (e.g. by *Saperda calcarata*).

1109. PECHMANN, H. VON. Das Auftreten von Zugholz im Holz der Rotbuche und der Eiche und dessen Auswirkung auf die Festigkeit, das Schwinden, und die Furniertauglichkeit des Holzes. **[The occurrence of tension wood in the wood of Beech and Oak, and its effect on their strength properties, dimensional stability and suitability for veneers.]** [*Docum.*] *12th Congr. int. Union For. Res. Organ., Oxford 1956* No. *IUFRO* 56/41/4, 1956. pp. 2 + 2 photos, 4 dgms. [G.]

Tension wood showed greater strength in tension and impact bending tests, less strength in compression, and greater shrinkage %s, particularly ‖ to the grain. The occurrence of tension wood in veneers therefore causes a tendency to warp.

1110. PAUL, H. B. **One careless ax cut can degrade an entire veneer bolt.** *Sth. Lumberm.* 193 (2410), 1956 (63–4).

Although the cut itself ruined only 6 sheets of $\frac{1}{16}$-in. veneer peeled from a Red Pine bolt of ca. $11\frac{1}{2}$ in. diam. o.b., the accompanying damage in the form of distorted fibres and resin concentration caused defective veneer all the way to the knotty core.

1111. HERBERT, D. A. **Enclosing of vines by trunks of rain forest trees.** *Paper, Department of Botany, University of Queensland, Brisbane* 3 (1), 1954. pp. 6 + 1 plate. 2 refs. L.S.

Spiral inclusions in planks cut from *Araucaria cunninghamii* proved to be lianes that had been included and killed when the trees were ca. 2 in. in diam. The latter had subsequently increased normally in girth, with no external indication in the later formed wood of any early deformation.

853. Grading of Wood in the Rough

See also Nos. 475, 813, 1105–6.

1112. **Redwood log grades developed.** *Timberman* 57 (11), 1956 (90 . . . 93). 1 ref.

Details 4 grades of logs, suitable for the southern part of the region and based on diameter, length, 'through' and sapwood knots, rings/inch, slope of grain, and % recovery.

1113. GRUITER, C. T. R. DE. Classification et mesure des billes et grumes d'Afrique Occidentale à l'intérieur du Commonwealth Britannique. **[Grading and measurement of West African lumber and logs within the British Commonwealth.]** *Bois For. Trop.* No. 47, 1956 (3–10). [F.]

Sketches the history of the trade between the U.K. and West Africa and the development of the present system of log grading, and includes a table showing minimum, maximum and average numbers of logs in loads of 25, 50, or 100 tons for 12 important species.

1114. Padronização do cedro brasileiro. **[Standard for Brazilian Cedar [*Cedrela* spp].]** *Brasil madeireiro* 11 (112), 1956 (23–31). [Port.]

1115. OHSAWA, M., MIYAJIMA, H., and HIGASHIYAMA, K. **[Studies on the properties of Nara wood [*Quercus crispula*] grown in Hokkaido. I. Comparisons of some properties of Nara wood grown in various localities.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (793–869). 9 refs. [Jap.jap.e.e.]

Tables and graphs show for this commonly exported 'Japanese Oak' the relations between annual rings/cm., specific gravity and Brinell hardness number, with regressions for material from 4 separate districts. From this it is concluded that the timber should be graded, by rings/cm.: $A < 8$, B 8–13, and $C > 13$ rings/cm. A is suitable for construction, cooperage, farm implements and vehicles; B for furniture, cabinets, flooring and panelling; C for easy working where brittleness is of no account.

854. Grading of Converted Timber

See also Nos. 1114–5.

1116. TURNBULL, R. F. **Why and how timber is graded.** *Aust. Timb. J.* 22 (4), 1956 (402 . . . 421). 3 refs.

A comprehensive and detailed account of the steps taken for the establishment of grades and the fixing of official standards, with details of the existing status of grading in the Australian states. The industry aims at covering all important forms of timber production and manufacture, and work is already complete on the most important. [Cf. *F.A.* 13 No. 4370.]

1117. TURNBULL, R. F. **Grading of Monterey Pine.** *Aust. Timb. J.* 22 (5), 1956 (522 . . . 534, 556, 559). 2 refs.

American and Scandinavian grading and inspection practice is outlined, with examples, and the New Zealand and Australian Standards for grading *Pinus radiata* [cf. *F.A.* 13 No. 2585; 16 No. 3555] discussed. This timber already provides 10% of Australia's timber output, but mainly in somewhat knotty timber from logs averaging 8 in. in diam. With increasing supplies from second thinnings (15–20 years) and final fellings (some pruned) at 25 or, as advised, at 30–40 years, the dimensions and quality of this timber will improve. Grading standards will then need revision.

1118. LATHAM, B. **North American softwood grading rules. Part II.** *Emp. For. Rev.* 35 (2), 1956 (163–72).

Continuing his article [cf. *F.A.* 17 No. 4549] the author describes White Pine grading rules from Eastern Canada and then those for Red Pine issued by the same authority, the White Pine Bureau, and the three sets of rules for Eastern Canadian Spruce. He quotes examples from the 88-page rule book of the Maritime Lumber Bureau, pointing out that in practice the export market has found that six grades and seven dimensions are too complicated, so it is common practice to sell the top three grades as No. 3 and better, the next two under the joint title of Fourth and Fifth, while the sixth grade is not usually exported. Next the bilingual grading rules for Eastern Canadian Spruce, Balsam Fir and Jack Pine of the North Eastern Lumber Manufacturers' Association of U.S.A., and the Canadian Lumbermen's Association of Canada are dealt with in some detail. Finally the group known as Southern Pine is described with a table of strength values for the four principal species followed by a description of the grades and structural grades. *From author's summary.*

1119. SUNLEY, J. G. **Working stresses for structural softwoods.** *Bull. For. Prod. Res., Lond.* No. 37, 1956. pp. iv + 13. 5 refs. Price 1*s.* 3*d.*

Permissible working stresses are derived from the results of tests on small clear specimens for all the strength properties likely to be required in design for 9 of the most widely grown British softwoods and 3 of the more commonly used imported ones. *From author's summary.*

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 166, 839, 861, 900, 1137, 1182.

1120. KANE, M. W. **The determination of average fibre length.** *Tappi* 39 (7), 1956 (478–80).

The mean fibre length can be calculated on a sound theoretical basis by placing a sample of fibres on a slide, superposing a circle of known diameter, and counting the number of fibre ends inside the circle and that of fibres crossing the circle.

1121. GAIO, F. VELOSO. A Cryptomeria na produção de celulose—elementos para o seu estudo. [***Cryptomeria japonica* in pulp production—fundamental principles for its investigation.**] *Estud. Inform. Serv. flor. aqüic. Portugal* No. 63–*D*3, 1956. pp. 15. 14 refs. [Port.e.] Limited distribution.

A chemical analysis of wood of *C. japonica* from the Azores showed it to be suitable for sulphite pulping, partly by virtue of its low resin content. The results are presented of experiments to find the most suitable methods for cooking this species by the sulphite process. *From author's summary.*

1122. RAHMAN, K. **Grasses as raw material for pulp with special reference to its availability in Sylhet district, E. Pakistan.** *Pakistan J. For.* 6 (1), 1956 (2–9). 5 refs.

Gives some figures for amounts of grass by species (acreage and yield/acre), and yields of pulp, and costs of manufacturing paper from grass or Bamboo.

1123. [***Oxytenanthera abyssinica.***] *Rapp. Inst. nat. Étude agron. Congo belge 1954*, 1955 (112). [F.]

This small Bamboo has produced in 4 years, 8 tons/ha./year of dry matter (4·4 tons cellulose) at Yangambi.

1124. [**Special number mainly devoted to the use of *Ailanthus altissima* as a source of pulpwood.**] *Quaderno, Centro Sperimentale E. Paterno per l'Industria della Cellulosa, della Carta, e delle Fibre Tessili, Palermo* No. 2, 1956 (1–92). [It.]

Contains reprints of articles and lectures by *A. del Lungo*, *F. C. Palazzo*, and *A. R. Mosca*, on the potentialities of *A. altissima* as a pulpwood species.

1125. PEEL, J. D. **Rubber wood as a raw material for paper pulp or building boards.** *Planters' Bulletin, Rubber Research Institute of Malaya, Kuala Lumpur* No. 23, 1956 (29–35). O.R.E.

Data on fibre dimensions and chemical composition of *Hevea brasiliensis* and *Albizzia falcata* are compared with those of some pulpable species. Preliminary tests indicate that *Hevea* wood, which was used for paper making in wartime, is suitable for chipboard and fibreboard. Sufficient should be available from replantings for the next 10 years to make industrial operation possible (cost estimates are given). Later, other species, particularly *A. falcata* might have to be used.

1126. BHAT, R. V., and KARNIK, M. G. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part XXVI. Chemical pulps and writing and printing papers from Blue Gum (*Eucalyptus globulus* Labill.).** *Indian Pulp and Paper, Calcutta* 10 (4), 1955 (215–20 + 1 specimen sheet). 4 refs. B.P.I.R.A.

Laboratory and pilot-plant tests with sulphate pulping indicated that this species was suitable for the purpose, particularly when mixed with pulp of longer fibre. Mean length of fibre was 1·11 mm., mean diameter 0·014 mm. Pulp yield was 58·3% (unbleached) and 56% (bleached) of oven-dry material.

1127. FUKUYAMA, G., KAWASE, K., and SATONAKA, S. [**I—Alkaline (soda), II—kraft and III—NSSCP (neutral sulphite semi-chemical) pulps from *Sasa* spp.**] *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (321–381). 121 refs. [Jap.jap.e.*e.*]

Details are given of the compositions and strengths of the pulps obtained by these 3 processes under varying conditions of cooking. The kraft process gave the strongest pulps. The NSSCP, when yield was 54–77%, produced fibreboards stronger than those from wood chips; pulps from this yield range were weaker than Birch NSSCP but showed excellent tearing strength and their α-cellulose content was 59·81%. Both the kraft and NSSCP processes are recommended. [Cf. *F.A.* 17 No. 3434.]

1128. QUICK, R. H. **A study of the hemicellulose removed during a neutral sulphite semichemical cook of Aspenwood.** *Tappi* 39 (6), 1956 (357–66). 23 refs. P.R.

1129. SERENIUS, R. S. **Sulphite pulping of Western Hemlock, Balsam [*Abies grandis* with some *A. amabilis*] and [Sitka] Spruce.** *Pulp Paper Mag. Can.* 57 (9), 1956 (133–7). 2 refs.

Presents in tables and graphs the yields and strengths of the pulps of the 3 materials at constant permanganate number, cooking schedules, and screenings content, illustrating how the data from an experimental digester can be applied on a mill scale for various combination ratios of the raw materials.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 881, 1125, 1127.

1130. KOLLMANN, F. **The present state of the technology of waste wood board manufacture.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2700, 1956. pp. 25 + 15 photos, 18 dgms., 1 gph. 4 refs. Transl. by E. Feigl from *Holz Roh- u. Werkstoff* 12 (4), 1954 (117–34). [See *F.A.* 16 No. 1201.] P.R.

1131. **Waferboard uses cross grain chips.** *Lumberm.* 83 (7), 1956 (78–80, 140).

Describes equipment and methods used by Pack River Lumber Co., Sandpoint, Idaho, in the manufacture of Tenex, a flake-type board. Sawmill slabs and edgings, after hydraulic barking, are sliced across the grain while still damp to make wafers of various widths but with predetermined thickness. The wafers are coated with resin and petrolatum wax before making up into panels and pressing.

1132. KITAHARA, K. **[On the pressing of chipboard by hot press.]** *Bull. Tokyo Univ. For.* No. 50, 1955 (127–35). [Jap.jap.e.]

Comprehensive data on the changes in temperature at various depths through chipboards during a cycle (20 min.) of the hot press, and similar data on differences, in successive layers, of the physical and mechanical properties. The boards were urea-resin loaded.

1133. NARAYANAMURTI, D. **Building boards from Bamboos.** *Comp. Wood* 3 (1), 1956 (1–13). 6 refs. P.R.

Results of comprehensive resistance tests at Dehra Dun with 'solid' strips of *Bambusa polymorpha*, *B. arundinacea* and *Dendrocalamus strictus* and building boards made of these species by different processes are tabulated. Service tests show that these boards compare favourably with plywood panels and natural boards of other species, when used for ceilings, furniture and similar purposes.

1134. SETNÍCKA, F. Zpracování buku na dřevovláknité desky. **[Fibreboards from Beech wood.]** *Dřevo* 11 (1), 1956 (15–6). [Cz.g.] P.R.

Pure Beech 'fibre' was obtained from unbarked firewood billets; the grinding fineness was 26–55 def[ibrator] sec.; the substances added were: 14·6 kg. $Al_2(SO_4)_3$ and 9·8 kg. paraffin wax per ton; the dry matter content after passing the thickener was 36·8%. Pressures were up to 560 [56·0?] kg./sq. cm., yielding a material of 3·8 cm. ultimate thickness. Average properties of the boards were: bending strength, 453 kg./sq. cm.; absorption of water 5–7% and 26–27% after 2 and 24 hours respectively.

1135. **Production of hardboard from secondary colonial timbers.** *Rep. For. Prod. Res. Bd., Lond. 1955*, 1956 (44–6).

Five methods of treatment were tested on boards made from Morabukea [*Mora gonggrijpii*] pulp, with the object of reducing their water absorption (w.a.). Hot-air treatment at 180° C. reduced w.a. from 70 to 33%. Adjustment of the pulp suspension to pH 5·5 (by adding H_2SO_4 and alum) before pressing, followed by hot-air treatment, produced the same fall in w.a., but the strength was less than without pH adjustment. Application of linseed-oil spray immediately after pressing, reduced w.a. to $< 30\%$ and increased strength. The addition of wax emulsion to the pulp suspension while reducing w.a. caused a progressive loss in strength. The addition of a specially prepared phenolic resin resulted in a considerable gain in strength, but the decrease in w.a. was relatively small.

1136. LEWANDOWSKI, W. Zastosowanie płyt pilśniowych do produkcji wagonów kolejowych. **[Use of fibreboards in the manufacture of railway carriages.]** *Przemysł Drzewny* 7 (1), 1956 (14–6). [Pol.] P.R.

Describes results obtained to date in Poland in the use of laminated fibreboards (2–5 super hardboards glued together with phenol-formaldehyde glue) for railway-carriage construction. The panels are 8–16 mm. thick and have a greater strength than their constituent hardboards, but are still not up to required specifications. Their sawing, drilling and finishing are discussed. They are made water-repellent by impregnation with a mixture of boiled linseed oil, turpentine, and a drier, at 60° C.

863. Wood Hydrolysis. Saccharification

1137. FUKUYAMA, G., and KAWASE, K. **[1. Production of furfural from 'Sasa'. 2. Production of furfural and pulp from 'Sasa'.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (383–438). 49 refs. [Jap.jap.e.]

(1) The highest yield of furfural obtained (11·6%) in these tests was when 100g. of Kumazasa [*Sasa albo-marginata*] were autoclaved with 1 litre of 1·5% H_2SO_4 at 80 lb./sq. in. for 3 hours. (2) When 200 g. of chips were autoclaved with 1 litre of 0·5% H_2SO_4 under various conditions, 58–65% of the residue was found suitable for pulp. When the extraction liquor, adjusted to 1·5% H_2SO_4, was autoclaved at 80 lb./sq. in. for 3 hours, a yield of furfural 5·4–6·7% of the oven-dry weight of the chips was obtained.

864. Utilization of Lignin

See No. 358.

866. Utilization of Wood Extractives

See also No. 740.

1138. DRYSELIUS, E., and LINDBERG, B. **Pinoresinol and its dimethyl ether from [resin extracted from outgrowths of the roots of] *Araucaria angustifolia*.** *Acta chem. scand.* 10 (3), 1956 (445–6). 3 refs. [E.e.] O.R.S.

1139. KONTEK, W. Wpływ rozpuszczalników na przebieg i wydajość procesu ekstrakcji karpiny. **[Effect of solvents on the run and yield of the resin extraction process for [Scots Pine] stumpwood.]** *Prace Inst. Tech. Drewna* 2 (1), 1955 (3–30). 15 refs. [Pol.pol.russ.e.] P.R.

In laboratory extraction tests with chips 2–5, 5–10 and 10–15 mm. in size, and of moisture content (m.c.) ranging from 0 to 50%, the solvents used were, besides the benzine commonly used in the industry, ethanol, methanol, benzene and ethyl ether. For small chips the best results were obtained with ethanol, particularly when the m.c. was high; for larger chips of high m.c. methanol was even better. Ethyl ether and benzene proved better solvents than benzine, but inferior to both alcohols.

867. Destructive Distillation

See also No. 993.

1140. TROXELL, H. E., and CAMPBELL, D. I. **Time-temperature study in small charcoal kiln.** *Res. Note Colo. Sch. For. Range Mgmt.* No. 4, 1956. pp. 2.

A study made on the kiln designed at the School [cf. *F.A.* 17 No. 3465].

1141. KOZLOV, V. N., and KRYMSKIĬ, G. P. **Thermal decomposition of wood, cellulose and lignin in aqueous medium under pressure.** *Trudy Instituta Himii i Metallurgii, Akademija Nauk SSSR, Uraljskiĭ*

Filial 1955 (2), (59–74). [Russ.] From *abstr.* in *Chem. Abstr.* 50 (12), 1956 (8995). P.R. [Cf. *F.A.* 16 No. 1223.]

1142. KOZLOV, V. N., and GULJAEV, B. N. **Pyrolysis of the Siberian Larch.** *Trudy Instituta Himii i Metallurgii Akademija Nauk SSSR, Uraljskiĭ Filial* 1955 (2), (117–27). [Russ.] From *abstr.* in *Chem. Abstr.* 50 (12), 1956 (8995). P.R.

Pyrolysis of *Larix sibirica* gives the same amount of decomposition products as that of broadleaved species, yielding per 480 kg. of wood containing 20% of water: charcoal 120, volatile acids 14, alcohols 3, settled (insoluble?) tar 29, soluble tar and other organic products 37 kg.

1143. NAUCKE, W. Gaserzeugung aus Torf- und Holzabfällen. **[The generation of gas from waste peat and wood.]** *Holz-Zbl.* 82 (100), 1956 (1233–5). [G.]

Experiments showed that even small-scale generation from such fuels (including sawdust) of gases with low calorific value (1350 to 1500 cal./N cu.m. at a 1 atm. pressure and 0° C.) for use in gas motors can be fairly efficient and economical, utilizing from ⅔ to ¾ of the calorific value of the fuel. One kg. of wood waste of 25–30% m.c. produced about 1 h.p. of electrical energy. The generators and their operation are described.

1144. HANZAWA, M., and SATONAKA, S. **Carbonization of wood by dehydrating agent: I. Preparation and decolorizing power of hydrated active charcoal from wood.** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (439–63). 12 refs. [E.e.]

The best quality of active charcoals was obtained by heating (and stirring) the sawdust with 5 times its weight of 65–75% H_2SO_4 at 80° C. for one hour and 150° for 8 hours. The order of adsorptive activity (methylene blue and caramel tests) was *Quercus crispula*, *Tilia japonica*, *Picea jezoensis* and *Abies mayriana*, the first 3, especially the hardwoods, being excellent. The effects on these properties of brown and white rots in two other conifers are noted.

1145. KAWASE, K. **[Production of hydrated active carbon from decayed wood.]** *Res. Bull. Exp. For. Hokkaido Univ.* 17 (2), 1955 (627–45). 10 refs. [Jap.e.e.]

Tables compare the original composition and adsorptive powers (methylene blue, caramel and pencillin purification tests) of moist active carbon prepared from the sound wood of *Quercus crispula*, *Tilia japonica*, *Picea jezoensis* and *Abies mayriana*, with that from wood of *Larix leptolepis* and *Chamaecyparis obtusa* attacked by both white and brown rots.

89. Other ('Minor') Forest Products

892. Vegetable Products

See also No. 124.

1146. La production accessoire de la forêt méditerranéenne: note du Secrétariat. **[Minor forest products of the Mediterranean region: secretariat note.]** [*Docum.*] *5th Sess. FAO Jt. Subcomm. Medit. For. Probl., Nice 1956* No. *FAO/SCM/60*, 1956. pp. 77. [F.] Limited distribution.

Notes are given by countries under the heads: fibres; fruits and nuts; manna; pasture and leaf fodder; aromatic and medicinal plants; edible plants; tan- and dyestuffs; resins and gums; briar pipes; and miscellaneous.

892.1. Grass. Litter. Leaf fodder etc.

See No. 1122.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 166, 875, 930.

1147. PARDO, L. L., and RICCI, E. Estudio sistemático de la riqueza en taninos de diversas especies indígenas. **[Study of the tannin content of some native species.]** *An. Adm. nac. Bosques, B. Aires* 1956 (7–17). 3 refs. [Span.]

Of 32 Argentine forest species analysed, none, apart from those already well known as tannin producers, yielded quantities sufficient to be of economic interest. The results of the analyses are presented.

1148. KURTH, E. F., RAMANATHAN, V., and VENKATARAMAN, K. **The colouring matters of Ponderosa Pine bark: Part I.** *J. sci. industr. Res., India* 15*B* (3), 1956 (139–46). 18 refs. D.S.I.R.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also No. 157.

1149. BICK, I. R. C., CLEZY, P. S., and CROW, W. D. **The alkaloids of *Atherosperma moschatum* Labill. I. Isolation of the alkaloids [from bark and leaves] and structure of berbamine.** *Aust. J. Chem.* 9 (1), 1956 (111–9). 16 refs. O.R.S.

1150. BROWN, R. F. C., *et al.* **The chemical constituents of *Himantandra* species. II. The isolation of the alkaloids of *Himantandra baccata* Bail. and *H. belgraveana* F. Muell.** *Aust. J. Chem.* 9 (2), 1956 (283–7). 3 refs. O.R.S. [Cf. *F.A.* 16 No. 1236.]

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 112, 153.

1151. PICKERING, G. B. **Oil of turpentine.** *Colon. Plant Anim. Prod.* 5 (3), 1955 (182–200). 102 refs.

A review, dealing with methods of extracting gum, wood and sulphate turpentines, their production from different Pines in various countries, composition, uses and derivatives.

1152. PTASIŃSKI, T., and WISŁAWSKI, M. Straty żywicy w czasie przechowywania i transportu w zależności od rodzaju opakowania. **[Crude resin losses during storage and transport in different containers.]** *Sylwan* 100*A* (3), 1956 (84–8). 1 ref. [Pol.]

Conclusions from tests with barrels of different types (metal, Pine wood, and Oak) are that: (1) crude resin should not be stored in the forest longer than is

absolutely necessary; (2) metal barrels should be substituted for wooden ones wherever possible; (3) proper gaskets and suitable tight fasteners for lids should be provided with metal barrels; (4) barrels in store should be stood on wooden supports; (5) they should be transported in an upright position (hole up).

1153. KALINIČUK, E. M., and PAŠKEVIČ, A. JU. **[Determination of the per cent. content of dirt in crude resin.]** *Derev. lesohim. Prom.* 2 (7), 1953 (11–3). [Russ.] From *abstr.* in *Chem. Zbl.* 127 (8), 1956 (2319–20). [G.] P.R.

It is shown that 1 part by weight (g.) of dirt is equivalent to 4 parts by volume (c.c.) of dirt, determined by means of a described procedure based on comparing the volume of pure turpentine with that of the same turpentine after solution in it of the crude resin, when the % of dirt $S = 25\ V/g$, where g is the weight of the sample of crude resin taken; 70 g. crude resin is usually dissolved in 100–200 c.c. turpentine.

1154. PEJOSKI, B. O nekim osnovnim fizikohemiskim karakteristikama smole vrsti *Pinus strobus*, L. i *Pinus peuce*, Gris. **[Some fundamental physical and chemical characteristics of resins of *P. strobus* and *P. peuce*.]** *Šum. List* 79 (1/2), 1955 (28–30). 2 refs. [Croat.g.]

Different physical and chemical properties are tabulated for the resin, rosin, and turpentine obtained from these Pines.

1155. ILOFF, P. M., JR., and MIROV, N. T. **Composition of gum turpentines of Pines XXV-XXVII.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 45 (2; 3), 1956 (77–81; 153–6, 167–70). 16 refs. O.R.S.

Reports on: *Pinus koraiensis* (Korea) and *P. peuce* (Macedonia); *P. lawsoni* and *P. herrerai* (Mexico), and *P. ponderosa* (California coast); and *P. pringlei*, *P. michoacana* and *P. arizonica* (all from Mexico).

1156. LOMBARD, R., ROTOVIC, B., and CRIQUI, A. Étude de la composition des sécrétions d'Abiétinées. L'oléorésine de *Abies balsamea* (baume du Canada). **[The composition of secretions of Abietineae. The oleo-resin of *A. balsamea* (Canada balsam).]** *C.R. Acad. Sci., Paris* 242 (16), 1956 (2033–4). 8 refs. [F.f.] O.R.S.

1157. MCQUILLIN, F. J., and PARRACK, J. D. **The isomeric eudesmols and their association with carissone in *Eucalyptus macarthuri*.** *J. chem. Soc.* Aug., 1956 (2973–8). 15 refs. O.R.S.

1158. CHANDRA, I., SUD, R. P., and HANDA, K. L. **Chemical examination of the [fixed] oil from the seeds of *Albizzia amara*.** *J. sci. industr. Res., India* 15*B* (4), 1956 (196–8). 4 refs. D.S.I.R.

1159. ASPINALL, G. O., HIRST, E. L., and MATHESON, N. K. **Plant gums of the genus *Khaya*. The structure of *Khaya grandifolia* gum.** *J. chem. Soc.* April, 1956 (989–97). O.R.S.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 153, 1158.

1160. DUTTA, N. L. **Chemical investigation of *Entada scandens* Benth.** *J. sci. industr. Res., India* 15*B* (4), 1956 (194–6). 13 refs. D.S.I.R.

Describes two saponins isolated from the seed.

1161. JOUBERT, F. J. **A physico-chemical study of the proteins from the *Sterculia foetida* nut.** *J. appl. Chem.* 6 (6), 1956 (252–6). 5 refs. P.R.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See Nos. 1034, 1123, 1127, 1133, 1137.

893. Animal Products

See No. 456.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

1162. **[The role of forests in the economy of mountain regions.]** *Schweiz. Z. Forstw.* 107 (5/6), 1956 (297–374 + 2 plates). 10 refs.

A special number devoted to various aspects of the subject, including the following articles (language indicated in square brackets): The problem of 'mountain aid' (*H. Leibundgut*) [G.f.]; The protective role of the forest (*H. Gutersohn*) [G.f.]; The economic importance of mountain forests (*C. Auer*) [G.f.], [with some statistical data]; The mountain forest: source of income and a labour problem (*C. Hartmann*) [G.f.] [advocates making forest work a skilled occupation]; The control of secondary forest utilization (*B. Mazzucchi*) [It.g.] [deals chiefly with forest pastures, the need of funds for their amelioration, and the substitution of cattle for goats]; Opening up the forests (*E. Gaillard*) [F.g.]; Torrent training and afforestation as parts of 'mountain aid' (*A. Lombard*) [G.f.]; and Forest work (*H. Steinlin*), [deals also with the question of financing its intensification by mechanization etc.].

1163. Memoria sobre las actividades de este centro. **[Report on the work of this department.]** Dirección General de Montes, Caza y Pesca Fluvial, Ministerio de Agricultura, Madrid. 1955. pp. 102 + 36 plates, 2 dgms., 3 tbls., 12 gphs. [Span.]

This, the first report on the work of the Department, covers mainly the period from 1940 to the date of publication. It is intended to issue annual reports from that date onwards. Summaries are presented of the work carried out by sections dealing with forest ownership, exploitation; conservation;

public utility forests, private forests, forest statistics; economics and industries and also of the work of the services regulating boundary demarcation; forest management, forest seed and pest control. Accounts are also presented of the work of the various forest districts, of the section dealing with river fisheries and hunting; and of the Forest Research Institute at Madrid. A financial report is included.

902. History of Forests and Forestry

See also Nos. 291, 1193.

1164. FERGUSSON, J. L. F. **Forestry in Perthshire: notes on past history.** *Forestry* 29 (2), 1956 (81–9 + 1 photo). 33 refs.

Includes notes on first plantings of a number of exotic species.

903. Forest Policy, General

See also Nos. 795, 1171.

1165. HOWARD, SIR H. **Forests of South Korea (Part II): What to do in the future.** *Emp. For. Rev.* 35 (2), 1956 (152–62).

[Cf. *F.A.* 17 No. 4617.] Gives suggestions for the future and deals with such questions as forest problems, forest policy, forest legislation, forest organization, and management, staff, education and research. *From author's summary.*

1166. **A brief presented to the Royal Commission on Canada's Economic Prospects by the Canadian Institute of Forestry, Ottawa—February, 1956.** *For. Chron.* 32 (2), 1956 (141–66).

The brief covers the whole question of Canadian forestry in relation to the economic situation and future, and makes the following recommendations: That the federal government take the initiative in setting up a committee of foresters, forest administrators, economists, taxation experts, business men, political leaders and others as might be necessary or desirable, and that this committee be given the powers and facilities to: (1) determine a forestry goal consistent with Canada's economic prospects; (2) analyse the obstacles to attaining the goal; (3) recommend policies to overcome the obstacles; (4) recommend ways in which the Canada Forestry Act can be made a more positive instrument in developing sound forestry practices; and (5) recommend the means by which these matters will be given continuing attention. Recommendations are also made on forestry education.

904. General Regional Accounts of Forests and Forestry

See also No. 272.

1167. DUPLAQUET, L. Forêts et chasse en Eire. **[Forests and hunting in Eire.]** *Rev. for. franç.* 8 (8/9), 1956 (557–71 + 2 plates). [F.]

An account of the present state and extent of forests, the organization of the Forest Service, and methods of afforestation, together with a short account of hunting (number of packs etc. and methods).

1168. JAZĪRAĪ, M. H. **[The possibility of the diminution of some forest trees in Persia.]** *Mon. Bull. Iran. For. Serv.* 6 (10), 1956 (3–6). [Per.]

A short account of the forests of the Caspian littoral, the causes and effects of their continuing abuse and some suggestions for checking it. Species suffering most include *Juglans regia*, *Buxus sempervirens*, *Taxus baccata*, *Zelkova crenata* (all highly prized for their timber, and the Yew also for fodder), *Corylus avellana* (nuts and basket work), *Betula alba*, *Pterocarya fraxinifolia*, *Cupressus sempervirens*, *Juniperus* spp. and *Carpinus betulus*.

1169. EDWARDS, J. K. **Forestry in South Africa.** *Emp. For. Rev.* 35 (3), 1956 (292–301).

A survey of current practice, with particular reference to Natal and private afforestation there. Pines, Gums (especially *Eucalyptus saligna*, *E. grandis* and their hybrids) and Black Wattle (*Acacia mollissima*), their growing, tending, and marketing, are dealt with in turn and future prospects discussed, along with the problems of labour, rats, and fire, communications and sawmilling.

1170. WILTON, W. C., and LEWIS, H. S. **Forestry problems of the Bonavista Peninsula, Newfoundland.** *Tech. Note For. Br. Can.* No. 26, 1956. pp. 31. 4 refs.

A detailed study was made of 3 lumbering and 2 fishing communities: the data for each village consisted of a forest inventory, including growth and depletion. Economic factors were outlined. Soil samples were taken from representative sites, and typical profiles analysed. The results are set out in 16 tables and discussed.

1171. Aprovechamiento de los recursos forestales. Informes presentados por la Misión Forestal de la Organización de las Naciones Unidas para la Agricultura y la Alimentación. Tomo I. **[The development of forest resources. Reports presented by the Commission on Forestry of FAO. Vol. I.]** Departamento de Investigaciones Industriales, Banco de México S.A., Mexico, D.F. 1956. pp. 310. 45 refs. [Span.]

Presents the following reports on investigations made in Mexico between 1951 and 1953 by a group of experts appointed by FAO. (1) Report on silviculture (*D. T. Griffiths*): A survey of the forests, their rôle in the national economy, legislation, forest industries, production and consumption of forest products, with recommendations for future policy. (2) Suggestions concerning Mexico's forest problems (*L. Huguet*). [See *F.A* 16, No. 3623.] (3) Reforestation in Mexico (*L. Huguet*): Reports on nurseries and reforestation projects inspected, reviews legislation covering reforestation and suggests a programme. Appendices present tabulated data on the range of native species in Mexico, recommendations for species suitable for reforestation, and notes on planting methods in regions with a long dry season. (4) Forest entomology (*F. Hartig*): A survey of the main forest pests, of factors predisposing forests to outbreaks, and of the results of damage, with recommendations for both short- and long-term measures. A summary of the present distribution of Scolytidae in different parts

of Mexico is included. (5) The forest economy of Yucatán (*L. Huguet* and *J. Verduzco*): Describes shortly the vegetation of the region, exploitation of the forests and the present state of forestry and makes recommendations for management, protection, regeneration (both natural and artificial) of valuable species, the introduction of exotics, and the organization of a forest service.

1172. Mesas redondas sobre problemas del trópico mexicano. Anfiteatro 'Bolívar' de la Escuela Nacional Preparatoria 10 al 14 de octubre de 1955. [**Conference on the problems of tropical Mexico—held in the 'Bolívar' amphitheatre of the Escuela Nacional Preparatoria, 10th–14th October, 1955.**] Instituto Mexicano de Recursos Naturales Renovables, Mexico, D.F. 1955. pp. vi + 322 + 1 tbl., 1 map. Many refs. [Span.]

Includes, among others, the following papers: Tropical soils of Mexico (*N. Aguilera*); Tropical forests of Mexico (*T. Gill*); and Tropical Mexico, its possibilities and problems (*E. Beltrán*).

1173. Cochin, F. Mis impresiones sobre los trabajos forestales de Bolivia. [**Impressions of forestry in Bolivia.**] *Bol. for. Serv. for. Bolivia* No. 1, 1956 (11–26). [Span.]

Recounts briefly the forest situation in the highlands of Bolivia, the intermountain valleys, the *yungas* of La Paz, the Santa Cruz region and the Gran Chaco, and states the general policy of the Forest Service for each region.

1174. Coro, M. Distrito forestal de Yacuiba—descripción de su area correspondiente a clima, suelo y vegetación. [**The forest district of Yacuiba—description of the region from the point of view of climate, soil and vegetation.**] *Bol. for. Serv. for. Bolivia* No. 1, 1956 (53–72). [Span.]

The forest district of Yacuiba is limited by the outermost spurs of the Andes in the West, the Rio Grande and the eastern plains of Bolivia in the North, the Argentine Chaco in the South, and the Paraguayan Chaco in the East. It possesses a forest area of 37,000 sq. km. A short description is given of the vegetation and the exploitation of the forests, with brief notes on 12 of the principal timber species, their habitat, range and exploitation.

1175. Antezana, O. Distrito forestal de Cochabamba—algunos aspectos de la actividad forestal. [**Cochabamba forest district—some aspects of forestry.**] *Bol. for. Serv. for. Bolivia* No. 1, 1956 (81–8 + 2 tbls.). [Span.]

Presents some observations on the exploitation (*a*) of artificial stands for mining timbers and fuelwood and (*b*) of natural forest, and on the methods (largely inefficient) of processing and utilizing the timber. Tables give figures for production and consumption of timber from this region from July 1954 to July 1955.

905. Forest Statistics and Resources

See also No. 837.

1176. Paterson, S. S. **The forest area of the world and its potential productivity.** *Meddelande från Göteborgs Universitets Geografiska Institution, Göteborg* No. 51, 1956. pp. 216 + 4 maps. 10 pp. of refs. [E.]

Contains sections on: the cartographical representation of forest areas; their geographical distribution; their qualitative determination (site class and productivity); the forest regions (11 are listed and briefly described); and summary and prognosis (present and potential production, and consumption).

1177. Vorläufiges Rohergebnis der Waldstandsaufnahme. [**Provisional rough results of the [Austrian] forest survey.**] *Öst. Vjschr. Forstw.* 97 (1), 1956 (36–9). 5 refs. [G.]

Gives the chief figures for area, age distribution, volume and annual cut (actual and permissible).

1178. Siderides, D. P. **Forestry statistical data for Greece.** [Food and Agriculture Division, U.S. Operations Mission to Greece, Athens.] Vols. I–III, 1953. pp. 306. [E.]

Contains tabulated data under the headings: (*A*) Projects carried out (all available recorded statistics on nurseries, planting, forest roads, timber produced, range improvement, erosion control, buildings); (*B*) domestic forest products; (*C*) and (*D*) imported and exported forest products respectively; and (*E*) general data (including land use, forest types and ownership, forms of management, resin tapping, livestock, finance).

1179. Ferguson, R. H., and Howard, M. C. **The timber resource in Massachusetts.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1956. pp. v + 45 + 1 map.

Shows the area and condition of the forest land, volume and quality of standing timber, rates of growth and mortality, and extent of felling, for 1953.

1180. Larson, R. W. **Hardwood timber resources in Central and Northern Georgia.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 70, 1956. pp. 48.

1181. Cunningham, R. L., *et al.* **Lake States timber resources.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 37, 1956. pp. 31.

Gives information in tabular form on the areas of commercial forest land, net volumes of growing stock, annual mortality and the output of timber products in the Lake States up to 1st Jan. 1953.

1182. Horn, A. G. **Some highlights of pulpwood production in the Lake States 1946–55.** *Tech. Note Lake St. For. Exp. Sta.* No. 457, 1956. pp. 2.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See section 116.

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 263–4, 814, 1162.

1183. Scott, A. **Natural resources: the economics of conservation.** University of Toronto Press. 1955. pp. 184. Many refs.

The work is divided into the sections: I. The theory of natural resources and the practice of conservation. II. Criteria for conservation. III. The economics of conservation measures. The chief natural resources used to illustrate the arguments are forests, soil, and mineral fuels, and examples of the practice or the lack of conservation are drawn mainly from Europe and N. America.

1184. LEMMEL, H. Der deutsche Wald in der Bodenreform. **[Land reform and German forests.]** *Allg. Forst- u. Jagdztg.* 125 (3), 1954 (102–9). 8 refs. [G.e.]

Describes and compares the enactments of the four occupying powers and the local (State) regulations based thereon, particularly as they affect the expropriation of forest land (areas involved estimated at 50,000 ha. in the West and 967,000 ha. in the East). The main criticisms from a forester's point of view relate to the expropriation of land unsuitable for agricultural settlements and the loss of efficient management involved in the transfer of forest land to small-holders.

1185. **Afforestation and reforestation work in 1955. Annual reports.** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation, Nîmes 1956* No. *FAO/EFC/AF*/11, 1956. pp. 4 + 5 tbls. Limited distribution.

A secretariat note, tabulating statistical data from the member countries of the European Forestry Commission.

1186. GAUSSEN, H. La question sylvo-pastorale en Europe occidentale et Afrique du Nord. **[The question of the relationship of forestry and pastoral husbandry in western Europe [Jura, the Central Massif, the Swiss and French Alps, the Pyrenees, Spain, Italy, Sicily and Corsica] and North Africa.]** *Trav. Lab. for. Toulouse* 1 (5), Art. 23, 1955, pp. 10. [F.] [Cf. *F.A.* 16 No. 2554.]

1187. GAUSSEN, H. La question sylvo-pastorale aux Hautes et Basses-Pyrénées. **[The question of the relationship of forestry and pastoral husbandry in the Hautes and Basses-Pyrénées.]** *Trav. Lab. for. Toulouse* 1 (5), Art. 22, 1955. pp. 13. [F.] [Cf. *F.A.* 16 No. 2554.]

1188. REY, P. Le problème sylvo-pastoral dans les Pyrénées françaises. **[The problem of forestry and pastoral husbandry in the French Pyrenees.]** *Trav. Lab. for. Toulouse* 1 (5), Art. 24, 1955. pp. 12. [F.]

1189. WAUTHOZ, V. L'équilibre agro-sylvicole de l'Ardenne. **[The balance of agriculture and forestry in the Ardennes.]** *Bull. Soc. for. Belg.* 63 (6), 1956 (273–90). [F.]

1190. CAMAITI, H. Relation entre forêt et agriculture dans la montagne italienne. **[The relation between forest and agriculture in the Italian mountains.]** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation, Nîmes 1956* No. *FAO/EFC/AF*/10-*L*, 1956. pp. 12. [F.] Limited distribution.

92. Forest Ownership and Ownership Policy

See also Nos. 801–3, 1184, 1197.

1191. MOSS, A. **Forest management licences in British Columbia.** *Emp. For. Rev.* 35 (3), 1956 (257–73). 3 refs.

Describes the main terms and conditions of such licences, their advantages to Government and industry, and the progress of their acceptance. Various criticisms are discussed and a concrete example of the working of the Okanagan (West) Forest Management Licence is given in detail from the author's own experience.

1192. KROTH, W. Die betriebswirtschaftliche Auswirkung des Erbgangs auf private Forstbetriebe. **[The effect of succession by inheritance on the management of private forests.]** *Forstwiss. Forsch.* No. 5, 1955. pp. 98. 96 refs. [G.g.]

Discusses the history of the law of inheritance, particularly in Bavaria, the effect of fragmentation on small forest holdings where law and custom favour partition among heirs, and of the need for cash, leading to overcutting, where holdings pass undivided and other heirs have to be compensated, also where, as in the case of large holdings, considerable amounts have to be paid in death duties. Changes in the law of inheritance and in death duties are recommended to safeguard the forests.

93. Public Supervision and Regulation of Forestry, Including Legislation for these Purposes

See Nos. 1191–2, 1199.

1193. SCHWARTZ, E. Die Schmalkaldische Holzordnung von 1555. **[The Schmalkalden forest ordinance of 1555.]** *Arch Forstw.* 4 (7/8), 1955 (715–9). 4 refs. [G.]

Gives details of regulations for a limited area of the Thuringian forest, aiming at the protection, regulation, and regeneration of the forest (in princely, common, and private ownership) including the control of utilization, price and export, with general pointers for the early capitalist economy.

1194. LOPEZ AVILA, J. H. Legislación forestal boliviana. **[Forest legislation in Bolivia.]** *Bol. for. Serv. for. Bolivia* No. 1, 1956 (33–44). [Span.]

Summarizes forest legislation in Bolivia from 1886 to the present day and includes some data on the extent of the forests in Bolivia.

1195. IRMAY, H. DE [Editor]. Legislación forestal boliviana. **[Forest legislation in Bolivia.]** *Bol. for. Serv. for. Bolivia* No. 2, 1956. pp. 120 + 3 tbls. [Span.]

A brief history of forest legislation in Bolivia, with the text of the present laws relating to forests. Some statistics on the Bolivian forests are also included.

94. Other Methods to Implement Forest Policy

944. Co-operation. Collaboration of Forest Owners

1196. FRANÇOIS, T. **Forestry associations.** *Unasylva* 10 (2), 1956 (57–108).

A general survey of forest co-operatives and other forms of forest association throughout the world, their nature and work, and their effect on the application and formulation of forest policies.

1197. Forstwirtschaftliche Kleinwaldzusammenschlüsse. **[Associations of small forest owners.]** *Schriften des deutschen Forstwirtschaftsrates, Rheinbach bei Bonn.* 1956. pp. 95. [G.]

Two general papers on aspects of legal structure and policy are followed by regional accounts for the 6 federal states of W. Germany, and an official policy statement by the German Forestry Council. [Cf. *F.A.* 17 Nos. 3540–1.]

1198. ANDERL, J. Schleifholz aus den bäuerlichen Auwäldern Oberösterreichs. **[Pulpwood from peasant holdings of bottomland forest in Upper Austria.]** *Holz-Kurier, Wien* 11 (10), 1956 (9–11). [G.]

Describes a marketing project organized by the 'Chamber of Agriculture' which provided for direct sale, under the supervision of their forest officer, from small producers to the paper industry at mutually attractive prices. About $\frac{1}{3}$ of the total came from about $\frac{2}{3}$ of the holdings in quantities of 1–10 cu.m. which would have been difficult to sell privately.

945.1. Advisory and Information Services, Documentation Centres

1199. Der deutsche Forstwirtschaftsrat, 1953–1956. Dreijahresbericht. **[The German Council of Forestry, 1953–1956. Triennial report.]** *Schriften des deutschen Forstwirtschaftsrates, Rheinbach bei Bonn.* 1956. pp. 255. [G.]

[Cf. *F.A.* 17 No. 3542.] Includes chapters or articles on: The proposed German Forest Law, with several drafts and comments (*K. Mantel*); policy problems of the timber market—e.g. auction rings (*Ernst*); statistical research into the economics of forest enterprises under the direction of *J. Speer*, and into freight rates (*K. Mantel*).

945.4. Research

1200. THIRGOOD, J. V. **Research Record No. 2.** *Tech. Pamphl. For. Dep. Cyprus* No. 19, 1956. pp. 14 + 14 forms.

Gives (1) an account of recording procedures and organizational techniques in use in Cyprus, with a number of specimen forms; (2) notes on research in progress on exotic species other than Eucalypts; and (3) proposals for future research.

1201. ZENTGRAF, E. 12 Jahre Waldbauseminar an der Universität Freiburg i. Br. **[Twelve years' work at the Silvicultural School of Freiburg University.]** *Allg. Forst- u. Jagdztg.* 125 (1), 1953 (15–9). [G.e.]

Subjects investigated included: the influence of decaying roots on the roots of residual or later stands; the characterization of rooting types, the root system of *Abies alba* with its lack or dearth of short laterals [cf. *F.A.* 18 No. 84]; the differences in density and structure of Beech thickets on different soils; the constancy of characteristic species of a *Querceto-Fagetum* after 3 Spruce generations; the comparability of sites with similar vegetation on different soils; and the regeneration of *A. alba.*

1202. KRUEL, W. Die bisherige Arbeit des Instituts für Forstwissenschaften Eberswalde der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. **[The work of the Eberswalde Forest Institute up to 1954.]** *Arch. Forstw.* 4 (7/8), 1955 (734–9). [G.]

Summarizes the research work done on site factors, regeneration, introduction of exotics, yield and economics, with a list of future tasks for the last.

1203. GÜNTHER, H. Bericht über den Stand der Pappelforschung in den Deutschen Demokratischen Republik. **[Report on present position of Poplar research in the D.D.R.]** *Arch. Forstw.* 4 (7/8), 1955 (662–88). 9 refs. [G.]

A detailed and comprehensive review of the work done between 1942 and 1945 by the special substations and working groups of the Tharandt and Eberswalde Institutes, drawing on both published and unpublished information. The contributions of the following sections are detailed: (*a*) plant breeding, (*b*) physiology, (*c*) vegetation studies, (*d*) animal pests, (*e*) botany (fungal and bacterial diseases). Under (*a*) the work on the hybrids of *P. tremula* and on hybrids within the sections *Leuce* and *Aigeiros* and between the sections *Aigeiros* and *Tacamahaca* is described; under (*b*) results on assimilation, respiration and transpiration, Arland's wilting test and the torsion-balance techniques being used; (*c*) includes the mapping of Poplar sites; (*d*) contains a full list of animal pests and (*e*) some biological data on *Dothichiza populea* together with a full list of diseases and a list of 9 species or forms of Poplar in ascending order of resistance to stem diseases.

1204. **[Forestry research organizations in Jugoslavia.]** *Šum. List* 79 (11/12), 1955 (526–41). [Croat.]

Three articles: (1) Institute of Experimental Forestry, Split (*A. Horvat*); (2) Ten years of the Institute for Forestry and Game Management in Croatia (*J. Šafar*), and (3) Institute for Timber Industry Research (*S. Frančišković*).

1205. HORVAT, I. Radovi Šumarskog Odjela Poljoprivredno-šumarskog fakulteta u Zagrebu 1945–1955. **[Work done in the Forestry Section of the Faculty of Agriculture and Forestry at Zagreb during 1945–55.]** *Šum. List* 79 (11/12), 1955 (517–26). [Croat.]

Includes data on the numbers of forestry students and graduates each year (1954–55, 274 and 83 respectively) and publications of the staff (20 textbooks and 112 papers are listed). [Cf. *F.A.* 14 No. 4040.]

1206. NÄSLUND, M. **Report to the Government of Burma on a forestry and forest products research institute. Part I: Division of Forestry Research.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 456, 1956. pp. 58. Limited distribution.

1207. KOLLMANN, F. F. P. **Report to the Government of Burma on a forestry and forest products research institute. Part II: Forest Products Research Division.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 498, 1956. pp. 49 + 63. 20 refs. Limited distribution.

The technical appendices include lists of recommended books and periodicals, and equipment for the proposed Forest Products Research Division.

1208. **Research work of the Forestry Branch.** *Misc. Publ. For. Br. Can.* No. 6, 1956. pp. 39.

An account of the organization and principal lines of research being pursued by the Forestry Branch of the Canadian Department of Northern Affairs and Natural Resources.

1209. THOMSON, C. C. **The Acadia Forest Experiment Station.** *Misc. Publ. For. Br. Can.* No. 5, 1955. pp. 19.

A short account of the history of the station and research in progress.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also No. 1162.

1210. MANN, W. La forêt et l'homme: la forêt en tant que source d'emploi. **[The forest and man: the forest as a source of employment [in Western Germany].]** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation, Nîmes 1956* No. *FAO/EFC/AF*/10–*C*, 1956. pp. 5. [F.] Limited distribution.

1211. LAMERDIN. Die Waldarbeitsverhältnisse des Landes Baden-Württemberg. **[Forest labour conditions in Baden-Württemberg.]** *Forst- u. Holzw.* 11 (15), 1956 (318–24). [G.]

Gives data on the composition of the labour force —permanent, regular, or casual, male or female, old or young—as affected by the general industrial and economic structure in different parts of the country, working times per ha. and types of work, organization of teams, wage structure, housing and other benefits, and discusses means for retaining and recruiting forest workers in conditions of full employment.

1212. RISTIMÄKI, T. **The forest as a source of employment in Finland.** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation, Nîmes 1956* No. *FAO/EFC/AF/*10-*I*, 1956. pp. 15. Limited distribution.

1213. RISTIMÄKI, T., VÄÄNÄNEN, S., and HEIKINHEIMO, L. Maaseudun elinkeino- ja työttömyysalueet miestyövoiman ajankäytön perusteella. Maaseudun työvoiman tutkimuksia VI. **[Distribution by industry and unemployment of the manpower in rural districts in Finland. Finnish rural labour force studies VI.]** *Repr.* from *Acta for. fenn.* 63 (9), 1956. pp. 70. 21 refs. [Fi.e.*e.*]

1214. HEIKINHEIMO, L., and RISTIMÄKI, T. Metsä- ja uittotyövoiman määrä ja rakenne. Maaseudun työvoiman tutkimuksia VII. **[Size and structure of forest and log-floating labour force in Finland. Finnish rural labour force studies VII.]** *Repr.* from *Acta for. fenn.* 63 (7), 1956. pp. 142. 39 refs. [Fi.e.*e.*]

1215. MÜLLER, E. La forêt, source de salaires, en Suisse. **[The forest as a source of employment in Switzerland.]** [*Docum.*] *5th Sess. FAO European For. Comm. Wkg. Party on Afforestation and Reforestation, Nîmes 1956* No. *FAO/EFC/AF*/10-*J*, 1956. pp. 4. [F.] Limited distribution.

1216. Les salaires dans l'économie forestière. **[Wages in the forest economy.]** *Forêt, Neuchâtel* 9 (9), 1956 (187–92). [F.]

Compares Swiss foresters' wages with those in other industries, and analyses changes in the wage structure since 1939.

97. International Forest Policy and Other International Collaboration

971. Congresses. Conferences

1217. **Report of the eighth session of the International Poplar Commission, Spain, April-May 1955.** FAO, Rome No. *FAO/CIP*/81, 1956. pp. 85. Price 2*s.* 6*d.*

Includes special reports on observations made during the study tours in Spain following the Congress: Identification of Poplars (*G. Houtzagers, J. Pourtet* and *J. E. Elorrieta*), Poplar cultivation (*E. Allegri, F. W. Bauer, E. Gaillard* and *F. Jaime Fanlo*); Insects and acarids attacking Poplars (*R. Régnier* and *G. Ceballos*); Poplar diseases (*H. van Vloten, T. R. Peace*, and *J. Benito Martinez*), and The utilization of Poplar wood (*G. Giordano* and *F. Najera*).

1218. BÉGUÉ, L. La première session de la sous-commission du teck de l'Organisation des Nations-Unies pour l'Alimentation et l'Agriculture à Bangkok (Thaïlande). **[The first session of the Teak sub-commission of FAO, Bangkok.]** *Bois For. Trop.* No. 48, 1956 (7–19). [F.]

Gives some figures for production and a general description of Teak in Thailand, as well as an account of the conference.

FORESTRY THE WORLD OVER

References: 1. *Agriculture*, London; 2. *Chêne-Liège*, Constantine; 3. *C.P.P.A. News Bulletin*, Montreal; 4. *Forestry Chronicle*, Toronto; 5. *Forst und Holz*, Hanover; 6. *Holz-Zentralblatt*, Stuttgart; 7. *Manchester Guardian*, Manchester; 8. *New York Post*, New York; 9. *Revue Internationale des Produits Coloniaux*, Paris; 10. *Southern Lumberman*, Nashville, Tenn.; 11. *Timber Trades Journal*, London; 12. *Timberman*, Portland, Ore.; 13. *Unasylva*, Rome; 14. *Wood*, London.

International.

FAO.

A 'development center' on management of catchment areas ('watershed management') is to be held at Hazaribagh, India, 28 Jan.–23 Feb. 1957. Its object is to provide an opportunity for senior technicians of the Asia-Pacific region to participate in a thorough analysis of the problems underlying the present hydrological conditions in the region, and to share their experience and acquire first-hand information from visiting experts. The governments involved are invited each to send one forester and one agriculturist to the centre.

A 'Consultation' sponsored jointly by FAO and OEEC will take place at Geneva 21 Jan.–7 Feb. 1957, to discuss the technical and economic problems involved in the manufacture, marketing and use of insulation board, hardboard, chipboard etc. It is hoped that manufacturers, builders, merchants etc. will participate as well as research institutions.

The Latin-American Forestry Commission, at its 5th Session, resolved to set up a working party to frame a long-term programme for forestry development in Latin America.

A group of FAO officials have recently made a 3-week tour in Czechoslovakia in order to study the results of operations undertaken there for the regeneration of forests, both pure and mixed. Among the methods that have been employed are interplanting of broadleaved species to reduce windthrow in Silver Fir stands, strip and group planting, underplanting with mixed conifers, and application of chemical fertilizers on a large scale (**9**; Oct. 1956).

Conferences, 1957.

21 Jan.–7 Feb.	International Consultation on Insulation Board, Hardboard and Particle Board.	Geneva
March.	Asia-Pacific Forestry Commission 4th Session.	Bandung
,,	Asia-Pacific Forestry Commission Teak Sub-commission. 2nd Session.	Bandung
22 April–1 May.	International Poplar Commission 9th Session, and International Poplar Congress.	Paris
7–14 May.	European Forestry Commission 9th Session.	Rome
9–20 July.	Latin-American Forestry Commission 6th Session.	Guatemala
Sept.	International Chestnut Commission.	Geneva
18 Sept.–10 Oct.	Near-East Forestry Commission 2nd Session	Iraq

Argentina. Tenders have been invited for tree planting in the province of Entré Rios along the highways connecting the towns of Paraná, Diamante, Victoria and Nogoya, a total distance of 149 km. Plans, planting methods, and species to be used are laid down by the provincial forest service, and the contractors engage to take care of the trees for 18 months. The trees are to be mainly Eucalypts and Pines with some Oaks, Acacias, and Poplars (**13**; Oct. 1956).

Canada. A sixty-million-dollar pulp mill, providing direct employment for some 3000 persons in its manufacturing and logging operations, is scheduled for construction 10 miles N.E. of Prince Albert, Sask. It will initially produce 600 tons daily of bleached and unbleached sulphate pulp. Adequate timber reserves have been allotted to the company to allow for later expansion to double that output. In all, over seven million acres of productive pulpwood stands have been delimited, containing some 3500 million cu. ft. of Black and White Spruce, Jack Pine, Balsam Fir, and Black and White Poplar (**4**; Sept. 1956).

The Ministry of Fisheries in Canada is considering suing Forest Protection Ltd., for the destruction of 800,000 salmon and trout in a New Brunswick hatchery through insecticidal sprays intended to destroy Spruce budworm larvae. The hatchery is outside the budworm target area. After the first mass destruction of fish, the residual effects of spraying persisted for at least 2½ months (**8**; 29.6.56).

Colombia. Nearly 3000 prefabricated houses are being imported from Finland. Special features include a ventilation gap under the eaves, covered with mosquito net; insulation with hardboard; and impregnation against termites (**9**; Aug./Sept. 1956).

Germany. Following the recommendations of the IUFRO Congress, Oxford 1956, an agreement has been reached between the forestry faculties of Freiburg, Göttingen and Munich, the German Centre for Forest Bibliography, the German Union of Forest Research Organizations, the Federal Research Institute at Reinbek and the Federal Ministry for Food, Agriculture and Forestry to set up a documentation centre for the sciences of forestry and wood utilization at Reinbek. Its task will be the collection and classification of German and foreign titles, clarification of terminology, and the publication of an Abstract Journal. Following the recommendations of IUFRO, the Centre will concentrate in the first place on European and Asiatic literature. It is expected to start work in 1957 (**5**; 16.11.56).

Investigations into noise abatement carried out in 20 schools of a large German industrial town showed that trees and shrubs planted in front of a school materially reduced the traffic noise (**6**; 11.10.56).

Igraf, manufactured in a continuous process by impregnating cellulose with proteins, resins, and other substances, is stated to combine some of the properties of wood with those of parchment. Except when specially 'cigarette-proofed' with melamine resins, it is sold in rolls in widths up to 1·30 m., and can be used for covering table tops etc. (**6**; 13.9.56).

A new type of fire-resistant coating was tested on mining timber *in situ*. While untreated timbering burned fiercely and caused the roof to collapse within 40 minutes, the fire had not taken hold in the treated timber, and only the first 2 or 3 props showed signs of damage. Under the influence of heat, the coating had formed a dark, spongy, insulating layer 5–10 mm. thick, which adhered firmly to the sound wood underneath. Costs of treatment would amount to 1 or 2% of total timbering costs (**6**; 11.10.56).

Great Britain. The Forestry Commission has been experimenting with the use of gelignite, in the form of 1·6- or 4-oz. cartridges, in planting Poplars on heavy soils. The smaller charge makes a hole about the size of a normal planting pit at a cost comparing favourably with digging (**1**; July 1956).

The Timber Development Association is investigating 2 non-destructive methods of testing timber, based on the recording of small vibrations with electronic instruments. The 'sonic resonance' test measures the elastic properties of rods and prisms only. The 'ultrasonic test', measuring the time taken by ultrasonic waves to pass through a piece of wood, can be used to determine strength (flaws), and elasticity, in all sizes and shapes (**1**; Sept. 1956).

A new type of flooring, Aluflor, produced by Calders Ltd., London, can be laid directly on wood or concrete. The flooring panels, 18 in. square, consist of hardwood tiles $\frac{3}{8}$ in. thick on an aluminium-foil backing. They are square to ensure exact fit when laid, factory sanded, and fixed with a special adhesive. It is claimed that the panels have greater stability than 1-in. floors of the same species, and will withstand at least as much wear (**14**; Sept. 1956).

Greece. Professor Kräusel of Frankfurt has discovered in the Isle of Lesbos a petrified forest, covering several hectares, preserved in lava from a long extinct volcano. It is believed that this petrified forest, the only one of its kind in Europe, consisted of giant Sequoias during the Pliocene era (**2**; 15.11.56).

Guatemala. A decree of Feb. 1956 established a system of *Unidades* for the exploitation of the national forests and the development of forest industries. The system is similar to that in force in Mexico [cf. *F.A.* 15 No. 1013], but private forests situated within a forested area set aside for a *Unidad* are to be incorporated only at the request of their owners. The same decree prohibits the export of round wood or hewn timber, and enjoins the use of the metric system for the measurement of timber (**13**; Sept. 1956).

Hungary. The Canadian Minister of Citizenship and Immigration, who has been visiting the refugee camps in Austria, has arranged for the entire school of forestry, students and teachers, from Sopron University to migrate to a university in Canada. They escaped as a group by walking across the frontier a few miles away. There are more than 400 students, 30 teachers, and a good many dependents of the teaching staff. Only three professors were unable to get away. The University of British Columbia, noted for its faculty of forestry, will take charge of the Hungarians (**7**; 12.12.56).

Japan. The wood research department of Hokkaido has patented a flexible plywood that can be rolled. A factory for its production has been founded (**6**; 15.11.56).

Kenya. The Government has decided to settle nearly 7000 African families, many of them Kikuyu, in forest villages. No village will have more than 110 families, and each will be under the supervision of a European forester. A pilot scheme has already been started. The objects are, first, an increase in forest development, particularly the replacement of large areas of natural forest by exotic softwoods, and, secondly, to relieve overcrowding in the Kikuyu tribal reserve. Employment as forest-department squatters has always been popular with the Kikuyu, who appreciate the opportunity of cultivating virgin land. The villages will have welfare and social-service amenities (**13**; Sept. 1956).

Sweden. Many sawmills and paper mills in Sweden are using a new development in compressed air to keep waterways free of ice during the winter. An anti-freeze bubbler system with an AR3 compressor supplies air to a plastic pipeline laid along the bottom of the pond. Air bubbles released through the perforated pipe bring warmer water from the bottom to the top, keeping the log-pond free of ice and permitting year-round operations (**4**; Sept. 1956).

A large-scale application of this method is to be made by the city of Västerås on Lake Mälar. A shipping lane is to be kept free between the city and its port, Södertälje, 60 miles distant on the Baltic (**11**; 6.10.56).

Switzerland. An experiment has been made in the application of a systemic insecticide, Metasystox, for the control of *Taeniothrips laricivorus*. Layers of absorbent cellulose were rolled round the trunks of Larch trees, impregnated with 2·5 or 5% emulsion, and covered with strips of polyethylene. The efficacy of the insecticide was evaluated statistically by determining (*a*) bark splitting caused by the insect in the upper branches and leader, (*b*) the state of the terminal bud of the tree, and (*c*) height growth. Results were satisfactory, the 5% emulsion being more efficacious than the 2·5%. The efficacy of a given dose of insecticide decreased regularly with increase in stem diameter. Treatment was equally efficacious on trees of all provenances though untreated trees of different provenances reacted differently when attacked by the pest (**9**; Oct. 1956).

Turkey. The Forest Research Institute of Turkey has two experimental forests. One is Büyükdüz Forest, typical Black Sea coastal forest of mixed Fir, Beech, Pine and Oak at altitudes of 850–1500 m. The other, Çamkoru Forest, containing stands of *Pinus nigra* and *P. sylvestris*, at altitudes of 1300–1650 m., is transitional between the forests of the Black Sea region and the poorly forested steppe (**13**; Sept. 1956).

A wooden structure, 100–150 m. long, said to have been discovered under a thick layer of ice on the upper slope of Mount Ararat, is claimed by its finder to be Noah's Ark. According to him, a French and a Spanish research institute have confirmed that the wood is over 5000 years old (**5**; 18.10.56).

U.S.A. The Okanagan County (Washington) Porcupine Control Committee are offering $1000 in prizes for the best kill of this pest. A single porcupine is estimated to destroy $6000 worth of timber in its life-time. At the instance of the Western Pine Association, a Chicago food speciality canning company has made sample tests of canning porcupine meat and has tried it out at a press conference on the assembled representatives who did not 'find anything objectionable in canned porky' (**12**; Oct. 1956).

An 'electric eye' safety mechanism on a veneer clipper prevents the operation of the knife unless the beam is interrupted by the operator's hand at a safe distance from the knife (**10**; 1.9.56).

The use of sawdust as a medium for growing mushrooms has been tested at the University of Florida. Using one ton of sawdust mixed with oatmeal, it was found possible to grow 500 lb. of mushrooms in two weeks at room temperature (**3**; Sept. 1956).